4483

BRISTOL

INSTRUCTION NO. P12550

BRISTOL MODELS 550, 551, 552, & 553
DYNAMASTER® WIDE-STRIP RECORDER

INSTRUCTIONS

INSTALLATION
OPERATION
& SERVICE

THE BRISTOL COMPANY WATERBURY, CONN. 06720

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PLACE THESE INSTRUCTIONS WITH THE MAN IN CHARGE OF YOUR INSTRUMENTS

I M P O R T A N T

- Read these instructions NOW before installing instrument.
- Keep these instructions permanently & accessibly filed for future reference.
- Be sure to specify MODEL & SERIAL numbers when ordering parts, instructions, diagrams or data.
- Ship instruments or parts for repair or exchange only to Bristol's main or branch factories—not to Sales Offices.
- Be sure to—
  1. Identify your shipments with your exact return address & order number.
  2. Write nearest Bristol Factory or office giving your order number, directions & address for return shipment, full instructions for repair, etc.
- Report damage to shipments at once to shipping company. The **customer assumes responsibility for collecting any claim for damages** from the shipping company, on all shipments made on a collect basis.

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DYNAMASTER® WIDE-STRIP RECORDER

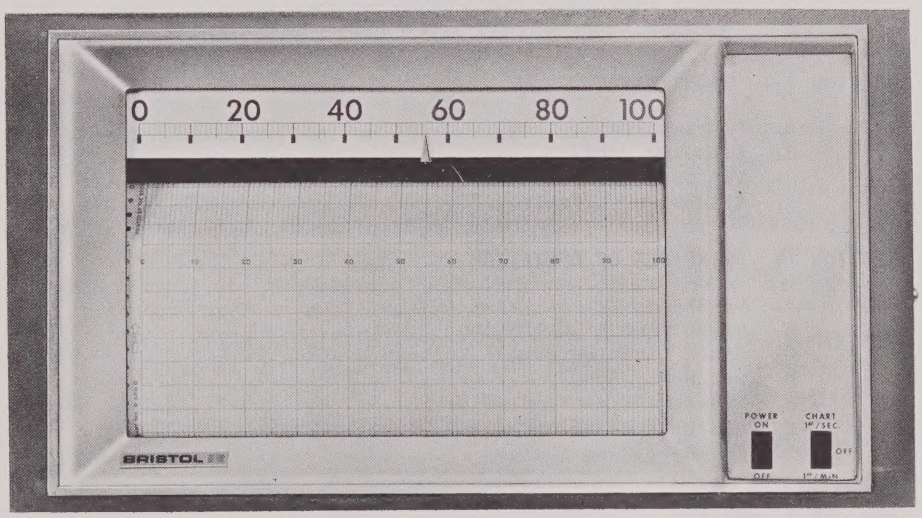

FIGURE 1. MODEL 550 DYNAMASTER RECORDER

THE BRISTOL COMPANY WATERBURY, CONN. 06720

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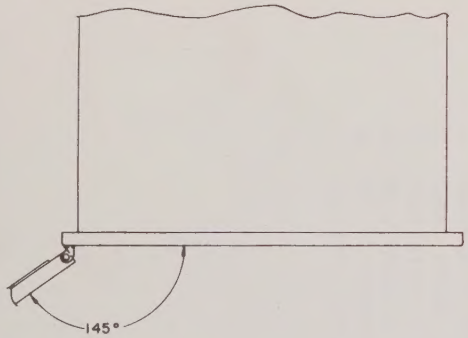
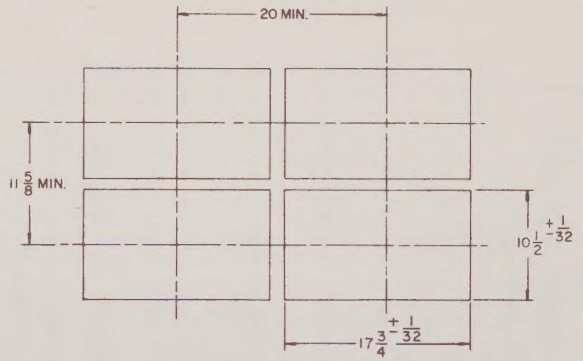
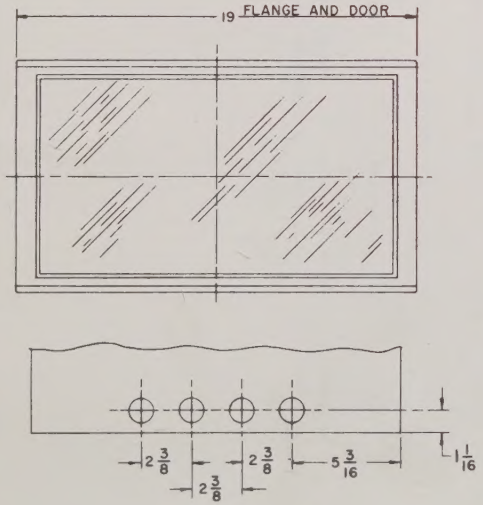
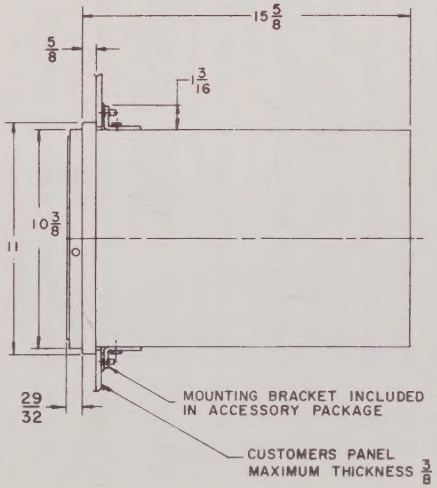




SUGGESTED PANEL MOUNTING DIMENSIONS





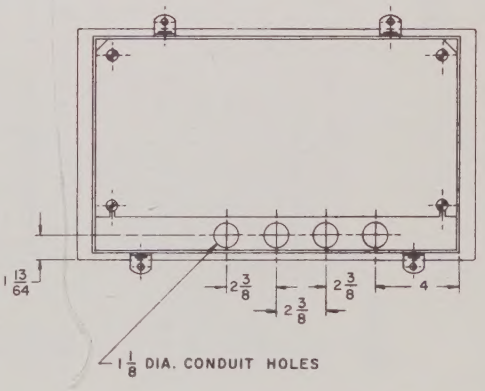
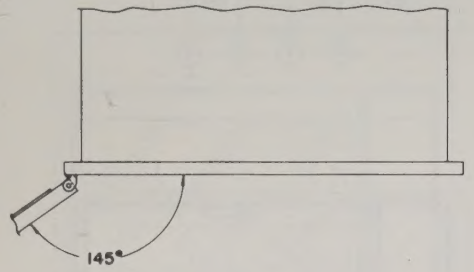
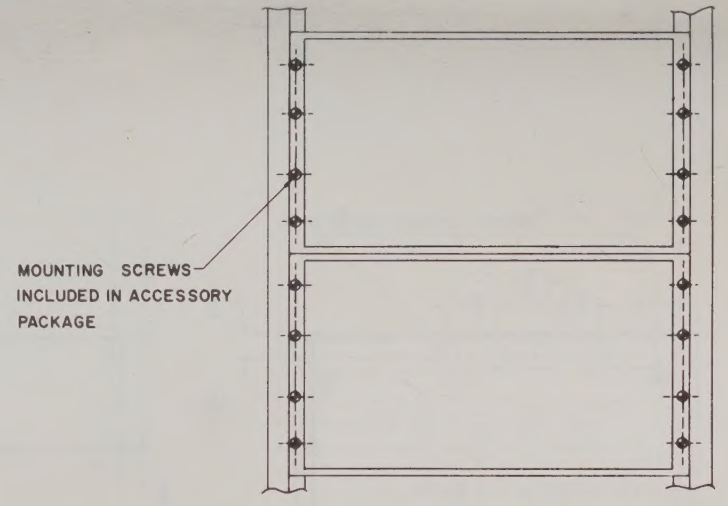
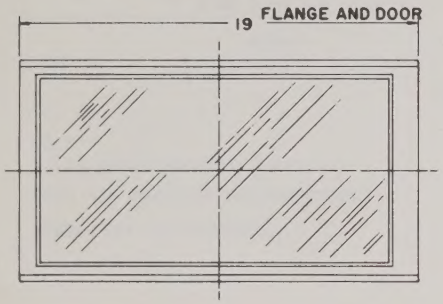


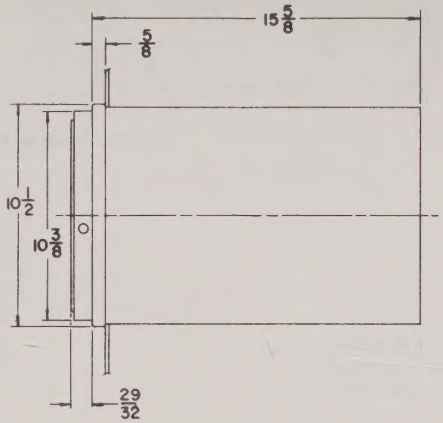
FIGURE 1-1 DIMENSION DRAWING FOR PANEL MOUNTED MODEL 550 DYNAMASTER RECORDER.

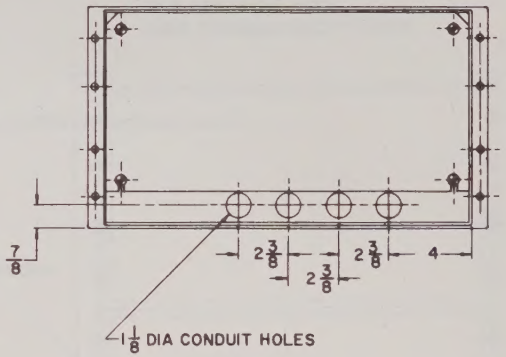




VIEW SHOWING INSTALLATION
IN A STANDARD RACK







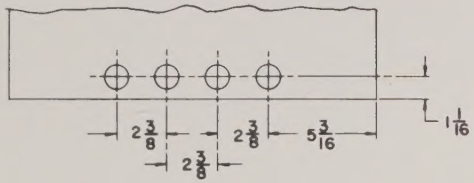


FIGURE 1-2 DIMENSION DRAWING FOR RACK MOUNTED MODEL 551 DYNAMASTER RECORDER.

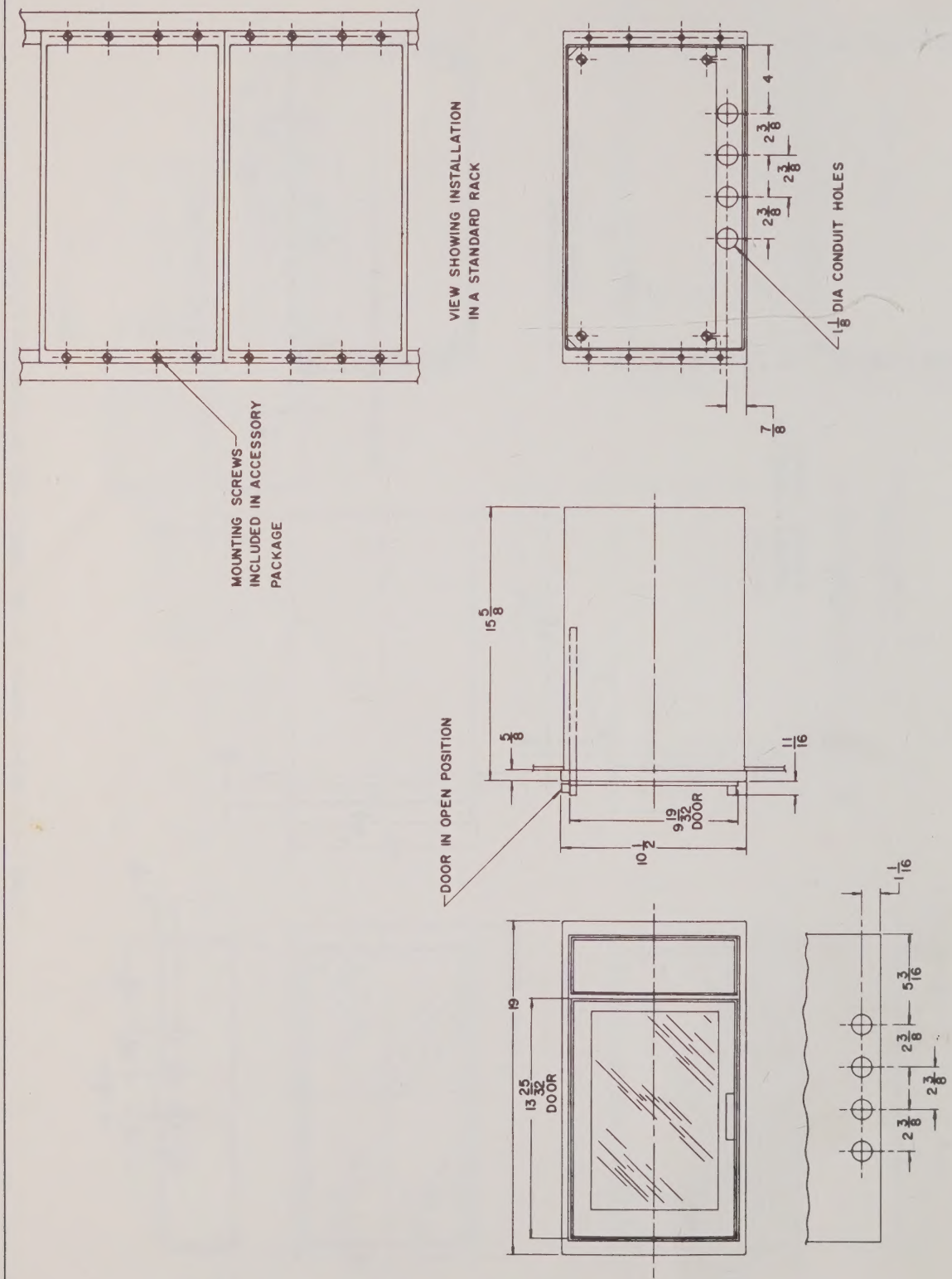


FIGURE 1-3 DIMENSION DRAWING FOR RACK MOUNTED MODEL 552 DYNAMASTER RECORDER.

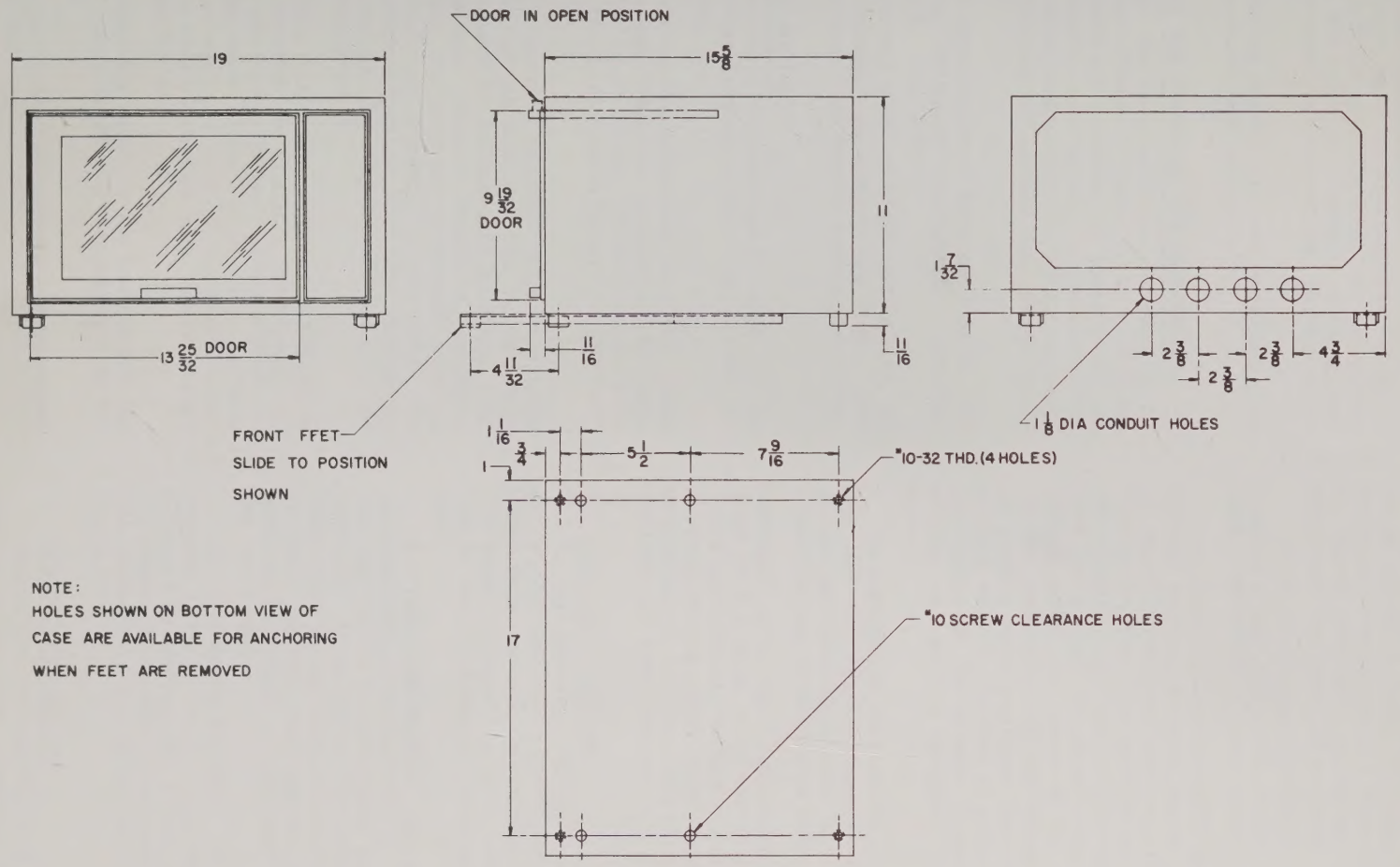


FIGURE 1-4 DIMENSION DRAWING FOR TABLE-TOP MODEL 553 DYNAMASTER RECORDER.

SECTION I INSTALLATION

A. Unpacking the Instrument

Do not throw away the packing material until you have found the mounting brackets and screws as shown in the mounting-dimension drawing, and the other accessories such as ink, charts, spare parts, etc.

Note: Table-top models are not supplied with mounting brackets and screws.

B. Locating and Mounting the Instrument

Although the instrument is designed to be free from the effects of dust, dirt, vibration, corrosive fumes and extremes of temperature, it should be located as remotely as possible from such unfavorable conditions. The location should also be convenient for service and general utility.

See the appropriate dimension drawing for mounting your particular instrument. (See Figures 1-1, 1-2, 1-3, 1-4.)

Note: To install rack mounted instruments, it is first necessary to remove the door. See para. G, section V on how to remove the doors.

C. External Wiring

All electrical connections are made at the terminal blocks located in the rear of the instrument (Fig. 5-1).

Before wiring the Dynamaster recorder, check the voltage and frequency listed on the nameplate of the instrument. This nameplate is located on the left-hand side of the pull-out chassis.

The instrument is provided with four holes in the bottom of the case and four holes in the back of the case to accommodate standard 3/4" conduit fittings. Conduit should be used, whenever practical, to bring all electrical circuits into the case. If conduit is not used, the rubber grommets supplied with the instrument should be used by piercing a small hole in the center of the grommet.

The wiring diagram(s) for your particular Dynamaster recorder are provided separately. In general the measuring circuit is covered on one sheet and the power circuit on another. If your instrument is equipped with an electric control or alarm, a third diagram will be furnished covering its wiring.

When connecting power to the instrument, the low side of the line should be connected to the L2 terminal.

A good ground must be connected to the terminal marked GND.

Note: For proper operation **do not** install measuring circuits, such as thermocouple wires, in the same conduit with higher-voltage lines.

The guard (GU) terminal is tied to the measuring circuit shield, slidewire and amplifier housings. When shipped from the factory, the GU (Guard) terminal is attached to the + side of the input (by means of a jumper wire).

When unshielded twisted pairs of signal leads are used, the wires should be appropriately connected to the + and - input terminals.

For optimum performance when common mode voltage (voltage between signal leads and ground or other circuitry) exists, the signal leads should consist of a twisted pair of wires that are shielded and the shield must be **insulated** from ground and any other circuitry. This guard shield should be connected to the GU terminal. (It is important that the shield **not** be grounded if common mode voltages are present as this voltage will be shorted to ground possibly causing damage to the primary element and associated wiring, as well as improper instrument performance.

On multipoint instruments, if shielded wires are used the shields should be insulated from ground and from one another and each shield connected to the respective + terminal.

Warning: If a high common mode voltage (greater than 30 V.) does exist between the input terminals and ground, **do not** remove the slidewire housing or the protection screen covering the measuring circuit and amplifier until this potential has been removed.

D. Chassis Withdrawal

1. All Models. The two handles (Fig. 1-5) below the left and right-hand corners of the chart face are used to withdraw the chassis from the case. The left handle, marked "pull", releases the latch which holds the chassis in the case.

2. Table-top Models. These instruments are provided with a spring stop so that the chassis can not be fully withdrawn except for major service. To withdraw the chassis fully, the front feet on the case should be pulled forward to their limits; then depress the stop spring with the left hand and pull out the chassis with the right hand.

3. Emergency Release. If the stop latch becomes inoperative for any reason, it may be released by moving the latch extension toward the right. This latch extension is in the center and forward of the front edge of the chassis plate.

E. Chassis Retraction

Always use the handles when pushing chassis back into the case. Chassis will latch automatically when in the "full in" position.

Caution: The instrument must always be in the "full in" position before either the sealed or hinged door can be closed.

F. Chart Installation

The chart roll may be installed with the chassis latched in its "full in" position or when the chassis is withdrawn beyond half way.

Release latches (Fig. 1-5) immediately below each end of the scale plate. This allows the chart drive to drop forward.

Lift idler roll up and over the drive roll.

Check the roll of chart paper to made sure that the end of the chart with the round perforations is even. If necessary, tap this end of the chart roll on a flat surface.

Remove tape from the roll. Put the right end of chart roll (end with elongated perforations) over plastic feedroll holder, pushing it against the right spring. Depress the pressure plate with the chart roll; then insert the roll into the left chart holder.

Feed paper over the chart drive-roll and under the idler roll. Flip idler roll to position shown in Fig. 1-7. This is the normal operating position of the idler roll.

Raise chart drive and latch it in its operating position.

Depress the tilt chart latch arm (Fig. 1-6) on left side and tilt chart drive out to the 45° position as shown in Fig. 1-8.

Attach the chart paper to an empty fiber core with the tape. Locate tape in the center of the core.

Insert core into the right-hand take up holder (Fig. 1-6) pushing rewind knob to the right.

Push left-hand holder to the left by means of the rewind knob and engage the key on the holder with the key-way on the fiber core.

Return chart drive to operating position by depressing the tilt chart lever arm.

Take up slack in chart by pulling upward on rear part of rewind spring.

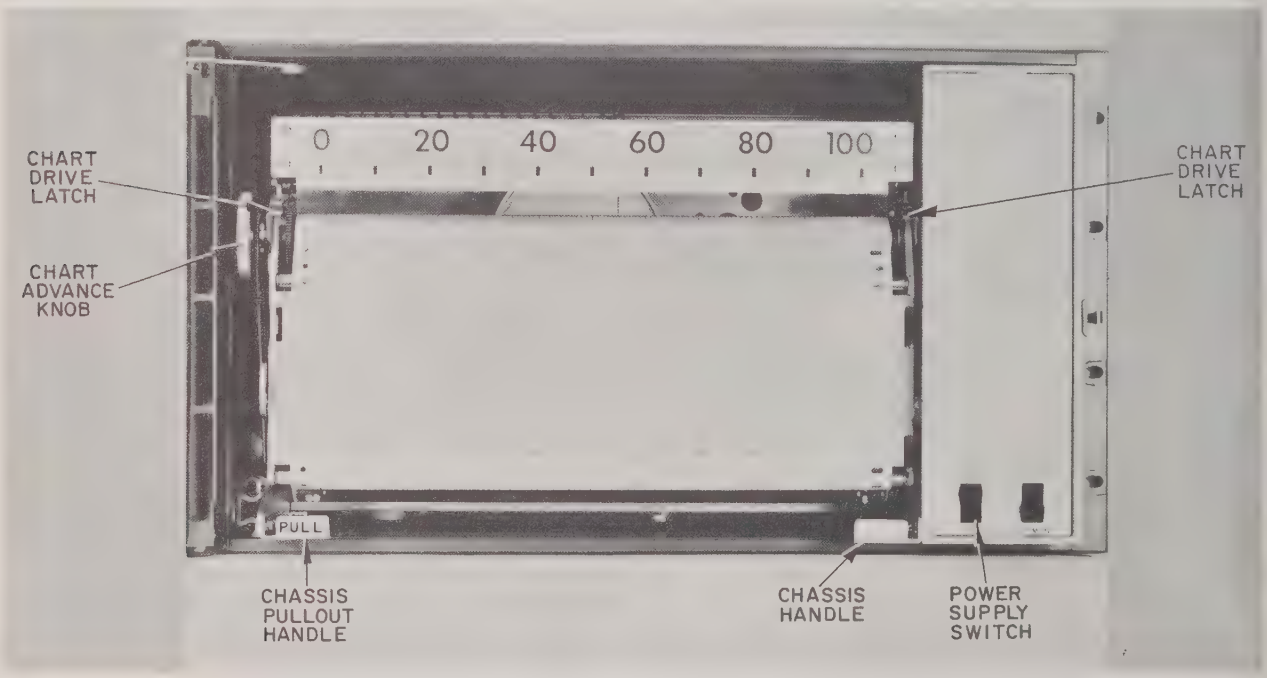
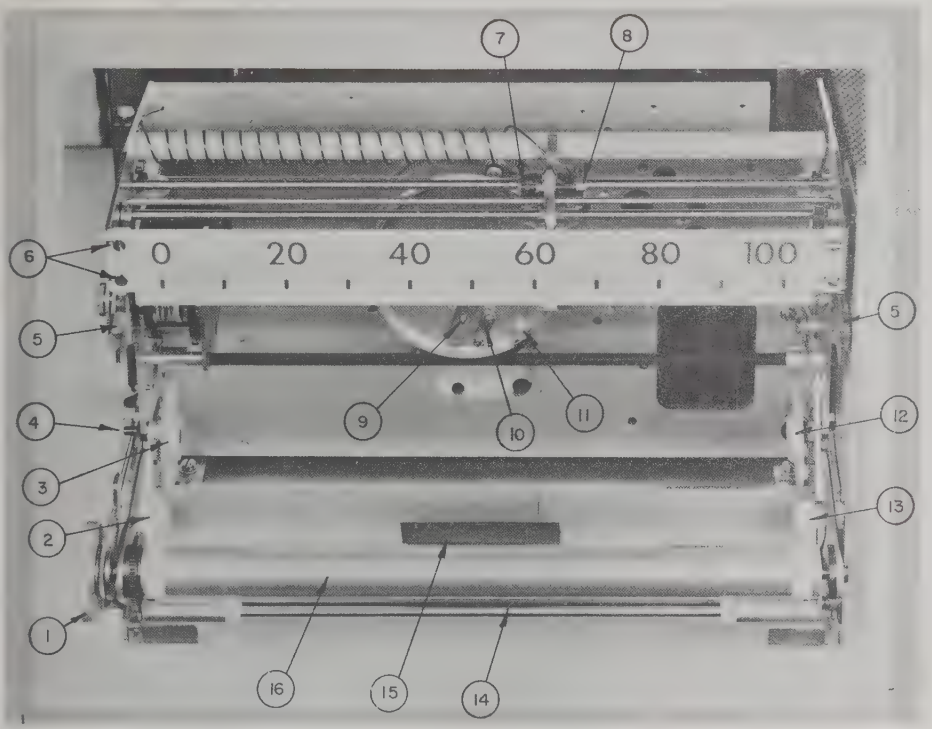


FIGURE 1-5 FRONT VIEW OF MODEL 551 WITH DOOR OPEN



LEGEND

1 - Chart Advance Knob
2 - Feed-roll Holder
3 - Take-up Holder
4 - Rewind Knob
5 - Chart-drive Latch
6 - Scale Screws
7 - Adjusting Pivot Screw
8 - Setscrew
9 - Arbor
10 - Clamp
11 - Post
12 - Take-up Holder
13 - Feed-roll Holder
14 - Idler Roll
15 - Pressure Plate
16 - Chart Drive Roll

FIGURE 1-6 CHART DRIVE DROPPED DOWN FOR LOADING.

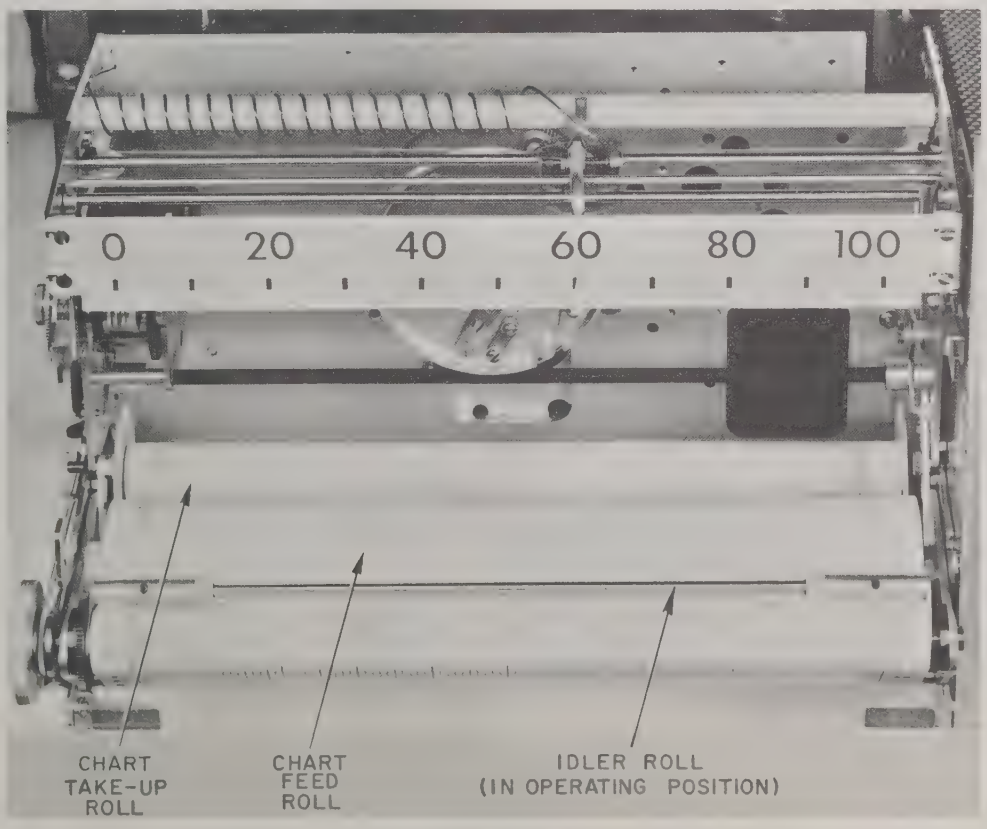


FIGURE 1-7 CHART DRIVE DROPPED DOWN AFTER LOADING CHART.

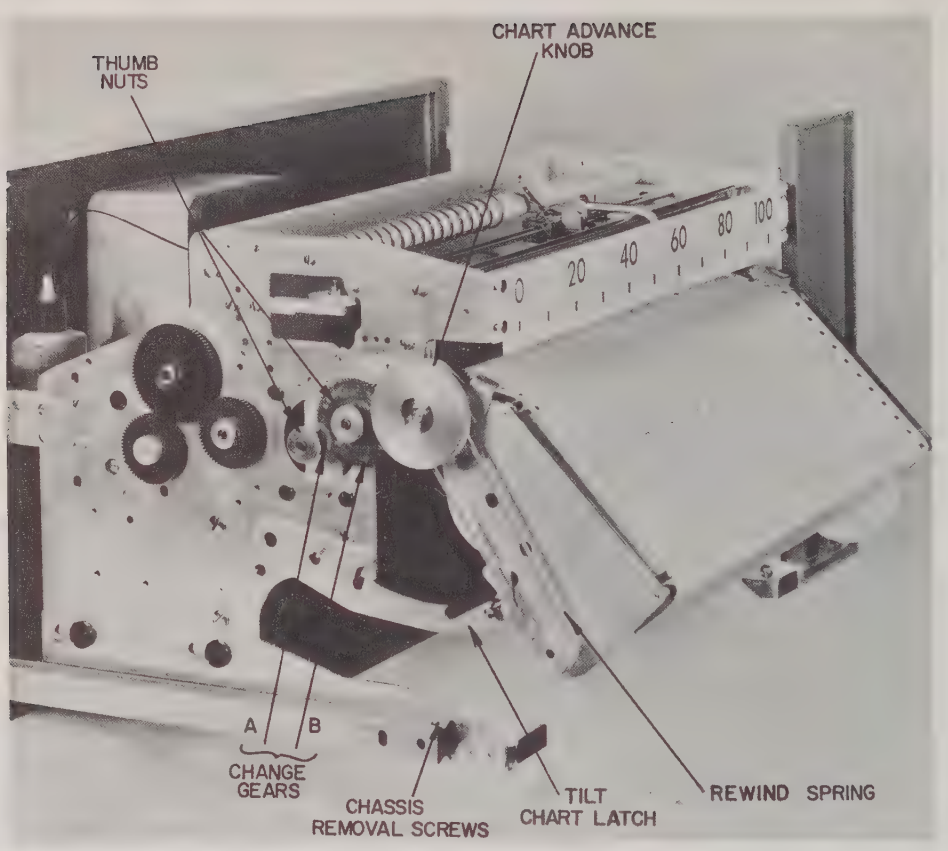


FIGURE 1-8 CHART DRIVE IN TILT POSITION.

SECTION II OPERATION

A. Startup

Check all customer connections shown on the wiring diagrams.

Turn on instrument power. The power switch is located in the lower portion of the control panel. This panel may contain other optional features such as a separate chart-drive switch, zero and span adjustments, etc.

B. Capillary Pens

1. Filling Ink Reservoir. Remove reservoir cap and fill reservoir up to the line marked "Fill to Line". Replace reservoir cap making sure that a portion of the capillary tubing lies on the bottom of the reservoir. The ink level should not be more than 1/2 inch above the pen tip.

2. Starting Ink Flow. Raise pen tip from chart and cover vent hole with finger (if necessary, rotate tip to ease covering hole). Place index finger over vent hole located on top of cap of plastic ink reservoir and squeeze reservoir between thumb and middle finger until a few drops of ink flow freely from pen tip. If ink does not flow, it will be necessary to remove the pen tip(see Section III-B) and insert cleaning wire into pen tip bore and then repeat above operation. If pen is plugged, relax pressure on bottle before removing finger from vent hole. If pen inks properly, remove finger from reservoir vent hole when relaxing pressure or ink will be drawn back into reservoir. Pen is now ready for operation.

3. Cleaning Reservoir. When reservoir needs refilling, empty reservoir and wash out with warm water before refilling. **Do not** continue to add to ink supply as ink will eventually thicken and plug the pen. Always wash out reservoir between each filling.

C. Ball-point Pens

Ball-point pens use a special mounting bracket.

To replace a ball-point pen, remove the cartridge end from under its bracket and unscrew the pen end from holder. Screw in the new pen and bend cartridge end under bracket.

A ball-point pen should exert a force of approximately 50 grams on the chart paper for optimum recording results with a wide range of writing velocities. The mounting bracket design for this attachment assures the correct angle and pressure for this pen. The pen mounts perpendicular to the chart paper.

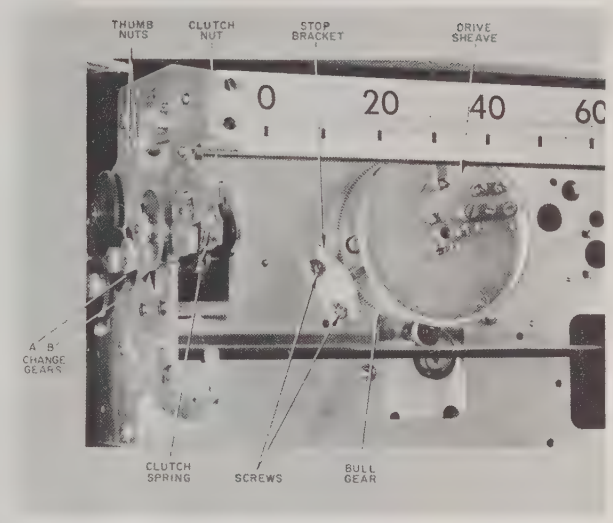


FIGURE 2-1 VIEW SHOWING BULL GEAR, SHEAVE, CHANGE GEARS AND CLUTCH.

D. Amplifier Gain Adjustment

1. As received, the amplifier gain (item 8, Fig. 4-3) has been factory adjusted for optimum response and will not normally need further adjustment upon installation.

If, however, the instrument performance is not correct it can be adjusted as follows: Allow the instrument to warm-up for 30 seconds. Manually turn the 4" bullgear (Fig. 2-1) to offset the pen several percent from the balance point. Release the gear and observe the pen behavior. If the system is over-sensitive, reduce the gain until the overshoot is just eliminated. If the response is sluggish, increase the gain (clockwise rotation) until the system overshoots, and then reduce the gain (counterclockwise rotation) until the overshoot is just eliminated.

2. For optimum step response, apply a step signal equal to approximately 20% of full scale span and adjust the gain until no overshoot of the pen is apparent. As above, it is best to increase the gain so that overshoot is apparent, and then reduce the gain to just eliminate the overshoot. Optimum step response is then automatically assured for any amplitude step signal.

E. Source Resistance Adjustment

The source resistance adjustment (item 2, Fig. 4-3) is located on the input filter card in the measuring circuit module. This adjustment is in series with the signal input leads. Proper adjustment of the source resistance assures optimum servo response and input filtering.

As received, the adjustment is normally set in its maximum position. Up to 1 K ohms source resistance variation can be tolerated and the servo system optimized by the amplifier gain adjustment alone. (See paragraph D above.)

If the source resistance is between 1 K ohms and 10 K ohms the variable resistance should be decreased so that the combined resistance of the source and adjustment equals 10 K ohms.

Poor matching of the source resistance will result in a noticeable hitch or overshoot in the instrument response.

F. Changing Chart Speeds

Chart speeds may be altered by means of the change gears and/or chart drive motors on all Bristol Series 550 Dynamaster instruments except those equipped with the 5-speed Turret Changer. Release the upper chart-drive latches and lower the chart drive. Remove the change-gear thumb nuts and gears from the shaft, (see Fig. 2-1).

Determine the chart-drive motor manufacturer and speed from its nameplate. Refer to Tables 1 and 2. The chart speeds are listed for each motor speed under the column headed by the motor manufacturer. For the required speed, determine the gear part numbers from the Table. Engage the gear keyway on the shaft and tighten thumb nuts.

SYNCHRON CHART DRIVE (Front Mount)				HOLTZER CABOT CHART DRIVE (Front Mount)				HOLTZER CABOT CHART DRIVE* (Rear Mount)					GEAR POSITION	NO. of TEETH	PITCH	PART NO.
1 RPM 120V. 60CY. A15398	6 RPM 120V. 60CY. A15360	8 RPM 120V. 60CY. A15364	2 RPM 120V. 60CY. A15362	2 RPM 120V. 60CY. B1276	4 RPM 120V. 60CY. 96738	20 RPM 120V. 60CY. B4061	60 RPM 120V. 60CY. B1279	1 RPM 120V. 60CY. B1277	2 RPM 120V. 60CY. B1276	4 RPM 120V. 60CY. 96738	10 RPM 120V. 60CY. 88060	20 RPM 120V. 60CY. B4061				
CHART SPEED-INCHES PER HOUR			CHART SPEED-INCHES PER MINUTE					CHART SPEED-INCHES PER MINUTE								
7 1/2	3/4	1	1/4	3/8	3/4	3 3/4	11-1/4	3/4	1-1/2	3	7-1/2	15	A B	16 64	40 40	92105 92103
10	1	1-1/3	1/3	1/2	1	5	15	1	2	4	10	20	A B	24 72	48 48	79225 79223
15	1-1/2	2	1/2	3/4	1-1/2	7-1/2	22-1/2	1-1/2	3	6	15	30	A B	32 64	48 48	79218 79222
30	3	4	1	1-1/2	3	15	45	3	6	12	30	60	A B	48 48	48 48	79224 79224
60	6	8	2	3	6	30	90	6	12	24	60	120	A B	64 32	48 48	79222 79218
90	9	12	3	4 1/2	9	45	135	9	18	36	90	180	A B	72 24	48 48	79223 79225
120	12	16	4	6	12	60	180	12	24	48	120		A B	64 16	40 40	92103 92105

*These motors may be used with 60:1 mechanical changer to provide inches per hour.

TABLE 1. MOTORS AND CHANGE GEARS FOR SINGLE-SPEED CHART DRIVES.

BODINE CHART DRIVE 120V. 60CY. -B3836				GEAR POSITION	NO. of TEETH	PITCH	PART NO.
BASE SPEED 60 RPM	B3838 TRANS-MISSION 60:1	B3837 TRANS-MISSION 30:1	B2699 TRANS-MISSION 10:1				
CHART SPEED-INCHES PER MINUTE							
45	3/4	1-1/2	4 1/2	A B	16 64	40 40	92105 92103
60	1	2	6	A B	24 72	48 48	79225 79223
90	1-1/2	3	9	A B	32 64	48 48	79218 79222
180	3	6	18	A B	48 48	48 48	79224 79224

TABLE 2. CHANGE GEARS FOR 2-SPEED CHART DRIVES.

SECTION III MAINTENANCE

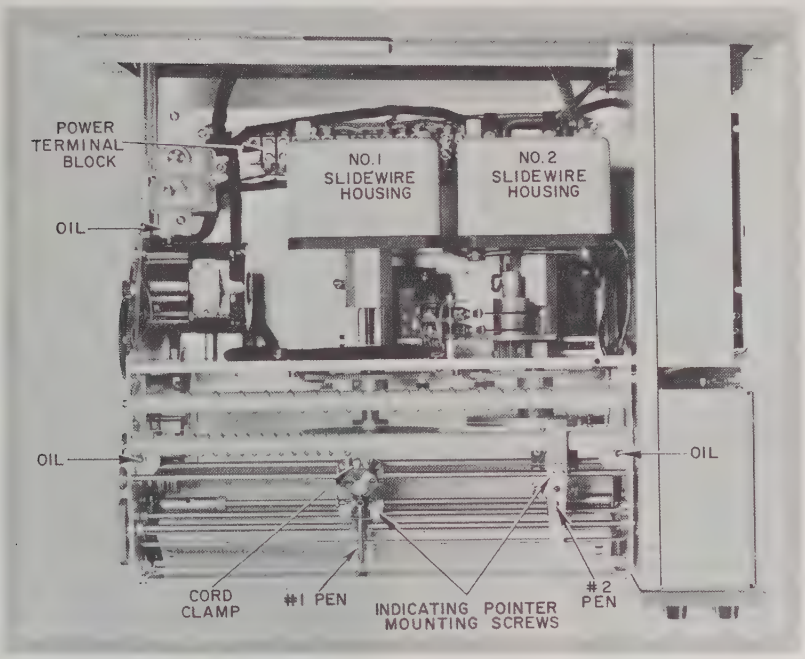


FIGURE 3-1 TOP VIEW OF 2-PEN CHASSIS.

A. Lubrication

Whenever practical, the Bristol Series 550 Dynamaster recorders have been provided with shielded or self lubricating bearings. However, a few points will require periodic lubrication depending upon the operating conditions of the instrument.

1. **Drive Cord Pulleys.** The drive-cord pulley ball bearings should be lubricated with one drop of light oil about **every six months.** (See Figure 3-1.)

2. **Chart Drives.**

a. **Holtzer-Cabot** gear case motors with oil cup, used on chart drives, should be oiled **every 3 months** with 3 cc's of light oil (Bristol Part No. 91982).

b. **Bodine** chart drive motors have two motor bearing lubrication holes (identified by two red holes) and a gear reducer lubrication hole (identified by a yellow hole). Add 4 drops of lubricant to oil hole of each bearing (red). For normal duty (8 hrs/day 5 day week) lubricate with 10 drops of oil **every 6 months.** For more continuous duty, add oil **every 3 months.** Lubricate the gear reducer with 20 drops of oil through the yellow hole **every 3 months.** For more continuous duty lubricate the gear reducer **every month.**

B. Cleaning the Pens

The pen nibs are removable for cleaning. The nib is threaded into barrel of the pen. If the pen becomes clogged, the nib should be removed and the obstruction pushed out from the barrel end with the pen cleaner wire furnished with the instrument.

Note: Never force the material which has clogged a pen back into the pen barrel. Always purge the capillary system to assure a free clean flow to the pen.

C. Pen Carriage Guide Rod

In some environments, the pen-carriage guide rod may become greasy or dirty, thus causing unnecessary friction and deadband in the recording system.

A periodic check should be made and, if necessary, the guide rod should be thoroughly cleaned with Bristol cleaning fluid or a solvent that will not leave an oily film.

Lubrication of the rod or carriage is not required.

D. Slidewire

The slidewire contact arm has been factory set with a pressure of 35-45 grams and normally does not require re-adjustment.

Cleaning the contact and slidewire. Caution: in cases where a high (greater than 30 volts) common mode voltage exists between the measuring leads and ground; this potential must be removed before taking off the slidewire cover.

The slidewire contact can easily be removed by loosening the two clamping screws and slipping the contact out. Instrument calibration is not affected.

Clean the contact and slidewire carefully with Bristol cleaning fluid and allow to dry. If the contact is badly worn, it should be replaced. Make sure the replacement contact has a pressure of 35-45 grams.

Apply a small amount of Cramolin on the slidewire and lightly wipe off the excess with a clean, lint free cloth.

Replace the slidewire cover.

Note: If any solvent other than Bristol cleaning fluid is used to clean the slidewire, it must be of a type that will not leave a residue or one that attacks varnish.

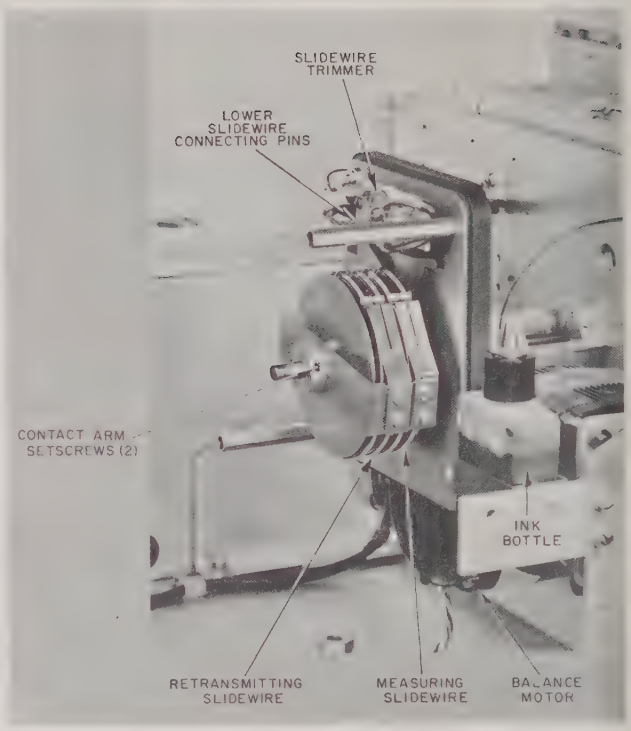


FIGURE 3-2 VIEW SHOWING SLIDEWIRES.

SECTION IV
PRINCIPLES OF OPERATION AND MAJOR COMPONENTS

A. General

The major components of the instrument are:

1. The normal mode rejection filter.
2. The potentiometer or bridge circuit and the slidewire and trimmer.
3. The Zener regulated reference voltage source located in the amplifier housing.
4. The transistorized amplifier.
5. The balance motor and gear train.
6. The recording system.
7. The chart magazine.
8. The chart drive mechanism.

B. Principles of Operation

The system consists basically of a potentiometer or bridge circuit, d-c to a-c converter, input transformer, transistorized amplifier, balance motor and recording mechanism, as shown in Fig. 4-1.

1. The potentiometer or bridge circuit. The potentiometer circuit measures an emf (electromotive force) by comparing it with a reference emf. The resistance bridge circuit measures the change in voltage across a variable resistance element. The "error" or difference signal between the measured and reference emf is converted from d-c to a-c by the Syncroverter® chopper converter. This error signal is then amplified by an input transformer and transistorized amplifier to a power level sufficient to drive a servo balance motor. The motor drives the recording pen mechanism and the contact on the potentiometer slidewire in a direction to decrease the error signal to zero. At balance, the position of the contact on the slidewire, and in turn the pen and indicator, is a measure of the input emf or resistance change.

2. The Balance Motor. The balance motor is geared to the recording mechanism and output shaft. The output shaft is available for auxiliary equipment such as alarms, controls, and retransmitting slidewires.

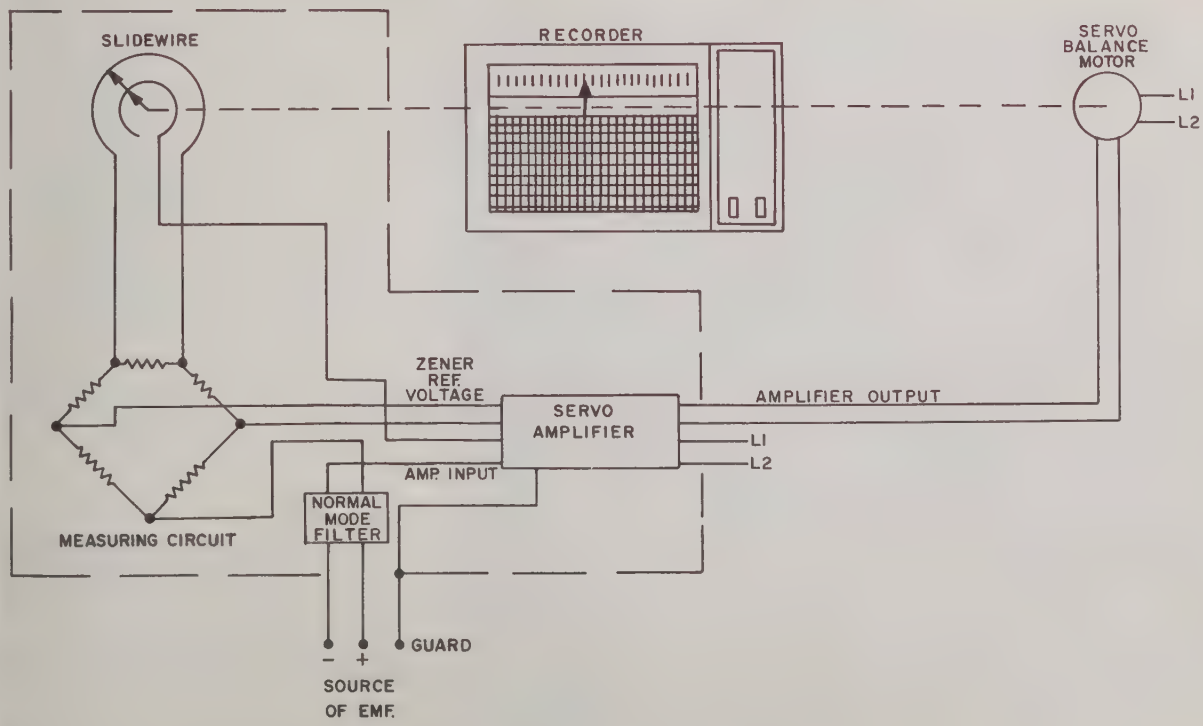


FIGURE 4-1 DRAWING OF SIMPLIFIED POTENTIOMETER.

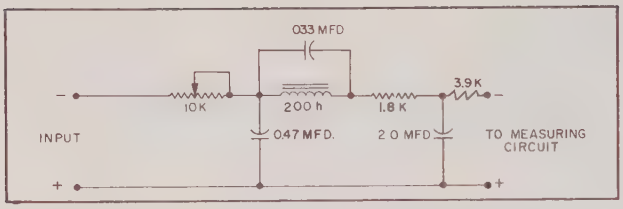


FIGURE 4-2 SCHEMATIC WIRING OF STANDARD INPUT FILTER.

3. The Electronic Module Section. The electronic module section (which includes the input filter, measuring circuit, reference voltage supply and servo amplifier) and slidewire are electrically isolated from other parts of the instrument. This isolated construction is used to minimize common mode voltage interference. The electronic section is enclosed by a protective grounded screen and the slidewire by an insulated cover.

Caution: In certain applications, when the input is floating, the electronic module and slidewire can be at a high potential. Do not remove the ground screen or slidewire cover until it is certain that this hazardous voltage has been removed.

4. The Input Filter. The input filter is located in the measuring circuit module.

It rejects normal mode voltages up to 2 times the electrical span of the recorder. For input source resistances up to 1000 ohms no adjustment of the filter is necessary. However, with a source resistance greater than 1000 ohms and less than 10,000 ohms, compensation for source resistance should be made by decreasing the value of the source resistance adjustment.

Other filters may be used for special applications.

5. Measuring Circuit. The measuring circuit, potentiometer or bridge, is located in the measuring circuit module. Range change can easily be made by pulling out one resistance spool card and replacing it with another. When changing the span, the amplifier gain may need re-adjustment for optimum performance.

The contacting fingers on the printed circuit card and the connector are hard gold plated to insure high reliability.

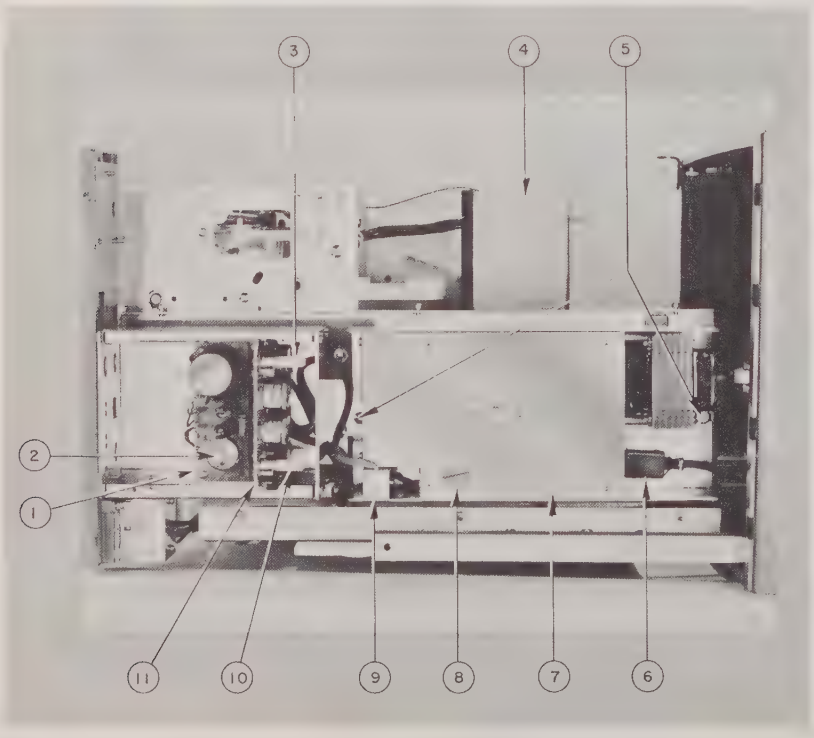
Typical measuring circuits are shown in Figures 4-5, 4-6, 4-7, 4-8 and 4-9.

On the Adjustable Zero and Span Card (AZ5), the zero and span can be adjusted approximately ±5%. These adjustments are identified in Figure 4-3.

The slidewire and trimmer are mounted under the protective cover, Fig. 4-3.

The slidewire is designed to give long and continuous service. The contact wipes across the slidewire keeping the contact clean and free of noise.

The span trimmer is located above the slidewire. (See Figure 3-2.) This is factory set and normally does not need re-adjustment.



LEGEND

1 - Normal Mode Filter
2 - Source Resistance Adjustment
3 - Zero Adjustment
4 - Slidewire Cover
5 - Amplifier Mounting Screws
6 - Power Connector
7 - Amplifier
8 - Gain Adjustment
9 - Input and Voltage Reference Connector
10 - Span Adjustment
11 - Measuring Circuit Spool Card

FIGURE 4-3 RIGHT SIDE OF CHASSIS WITH GUARD REMOVED.

C. Zener Diode Reference Voltage Source (used on d-c Potentiometers)

The Bristol Zener regulated Reference Source is an accurate d-c voltage supply with a high degree of stability and reliability. It utilizes Zener diodes as the reference elements in the pre-regulating and output stages of the regulating circuit. It is mounted inside the amplifier housing. The wiring for this unit is shown on the schematic wiring diagram for the amplifier.

This unit is factory adjusted to produce 8 volts ±0.004 volts at 3 ma. across the potentiometer bridge circuit. No additional field adjustment should be necessary.

If, however, a check of the reference voltage becomes necessary, a resistance load of 2667 ohms ±.03% should be connected across the reference output terminals. It is first necessary to remove the input signal and reference plug from the amplifier. See Fig. 4-3.

It is recommended that a Bristol cable and plug assembly be used to provide a reliable connection between the reference source output and the dummy load resistance.

A digital voltmeter or equivalent device with an accuracy of 0.01% should be used for the check. A calibration adjustment is provided on the reference source printed circuit card inside the amplifier.

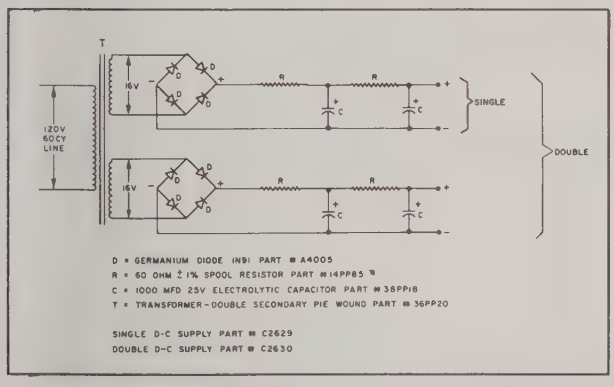


FIGURE 4-4 SCHEMATIC WIRING FOR SINGLE OR DOUBLE D-C SUPPLY.

D. D.C. Power Supply (used on resistance bridges)

The D.C. unregulated power supply is used in some applications which do not require a regulated reference voltage. This is a separate supply located above the measuring circuit module or at the rear of the chassis. The open circuit output voltage is nominally 20 volts d.c. and the internal output resistance is 180 ohms. The current drawn should not exceed 70 ma.

E. Transistorized Amplifier

The amplifier consists of a detector module and high performance silicon transistorized carrier amplifier (Fig. 4-3).

Power to the amplifier is supplied through a connector at the rear (Fig. 4-3). The amplifier output to the balance motor is also supplied through this connector. The amplifier input signal and the measuring circuit reference voltage are connected at the recepticle located at the side of the amplifier (Fig. 4-3).

Several detector input impedance modules are available for optimum instrument performance. The input impedance can easily be changed by replacing the detector module. The Syncroverter chopper is a plug-in unit on this module.

1. Detector Module. The detector module is composed of a d-c to a-c Syncroverter chopper converter and input transformer. These components are in series with the measuring circuit and input emf. The d-c error signal impressed across the chopped input is converted to a square wave a-c signal of the power frequency. The secondary of the transformer is tuned and provides for minimum phase shift through the input transformer when resistance is inserted in the measuring circuit.

2. Amplifier Circuit. The silicon transistorized amplifier consists basically of 4 R-C coupled voltage amplifying stages and a power output stage. The necessary 90° phase shift for motor operation is obtained in the Syncroverter chopper drive circuit. See amplifier schematic wiring diagram.

The input impedance depends on the type of input transformer used. Nominal values are 1000, 10,000 and 100,000 ohms. On drive, the maximum power delivered to the balance motor is 4 watts. A combination of d.c. through the servomotor and feedback around the output stage produces the required system damping, independent of the input filter.

F. The Balance Motor

The balance motor acts through the gear train to position the slidewire contact, indicating pointer and pen.

The motor has two windings. A reference field (black and white lead), which is connected to the 120 volt power line at the terminal block, and a low impedance 15 volt control winding (red and blue leads) which is connected to the output of the amplifier by way of the terminal block.

With the rotor blocked, the motor develops 3 oz. of torque at the motor shaft. The no load speed is 1600 rpm. Through the various gear trains, the torque is increased to a sufficient level to drive the recording system and attachment loads.

Sealed ball bearings, packed with long life grease, provide for reliable operation.

G. The Recording System

The recording system includes the sheave, pulleys, drive cord, pen and pen carriage or multiple printing mechanism.

The tension on the cord is adjusted by loosening the two clamp screws on the sheave and rotating the center take-up screw. The cord should not be so tight as to cause undue friction nor should it be so loose that it will cause deadband, or cause the cord to come off the pulleys.

The pen carriage can be repositioned on the drive cord by loosening the holding clamp screw.

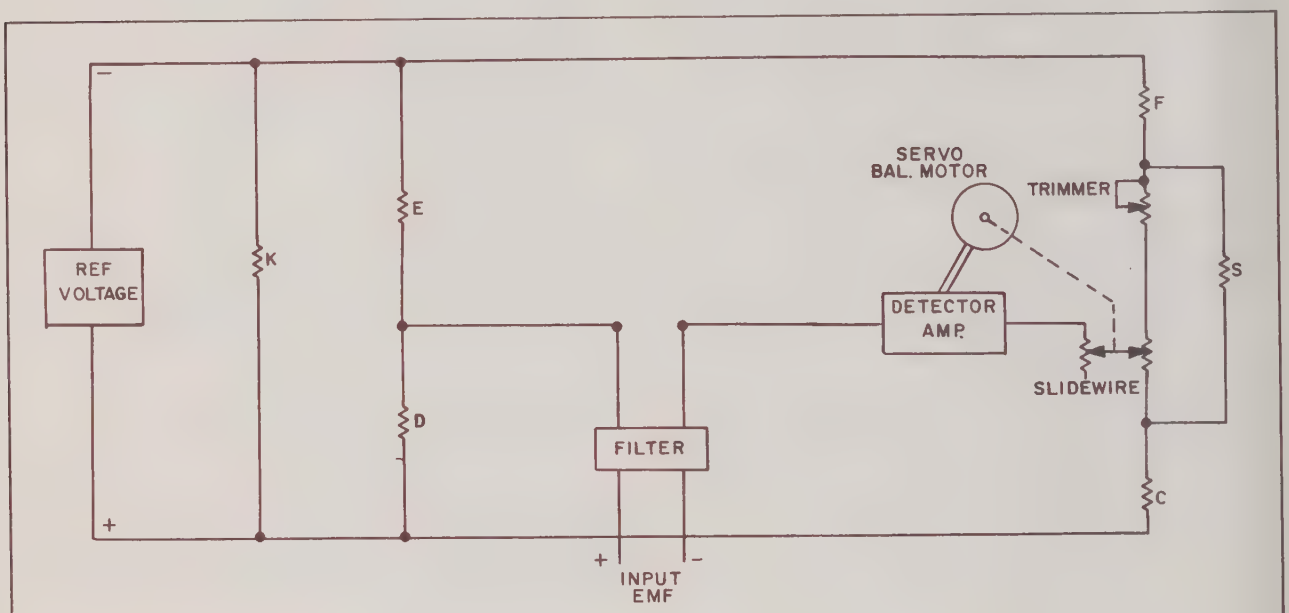


FIGURE 4-5 SIMPLIFIED SCHEMATIC OF STANDARD POTENTIOMETER TYPE MEASURING CIRCUIT.

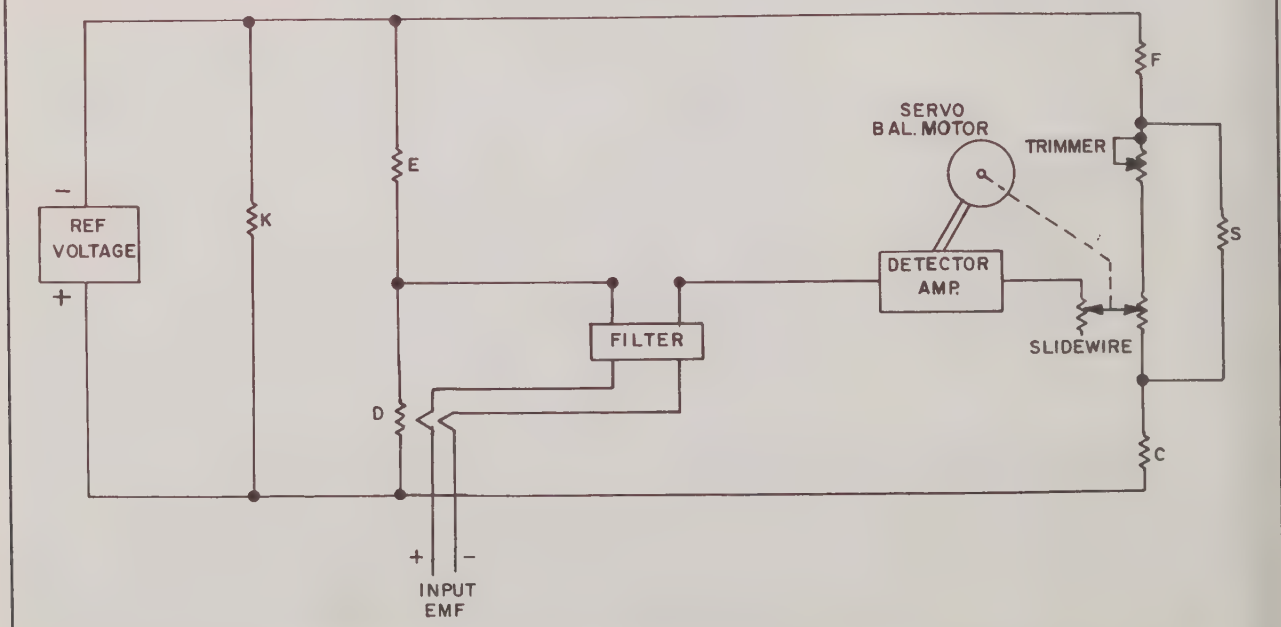


FIGURE 4-6 SIMPLIFIED SCHEMATIC OF STANDARD PYROMETER TYPE MEASURING CIRCUIT.

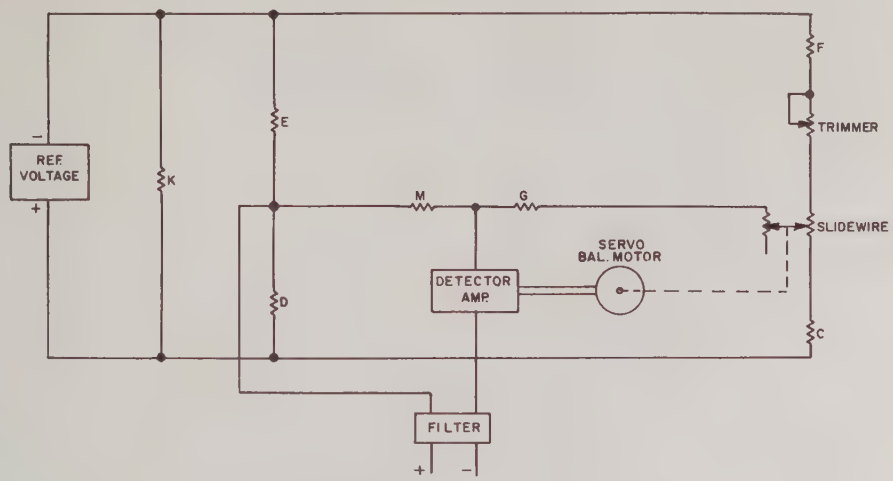


FIGURE 4-7 SIMPLIFIED SCHEMATIC OF DIVIDER-TYPE POTENTIOMETER CIRCUIT.

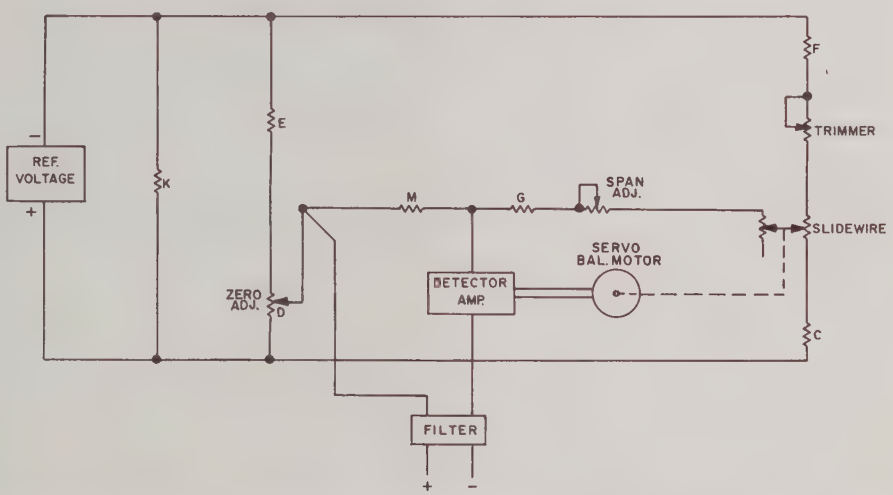


FIGURE 4-8 SIMPLIFIED SCHEMATIC OF DIVIDER-TYPE POTENTIOMETER MEASURING CIRCUIT WITH SPAN AND ZERO ADJUSTMENT.

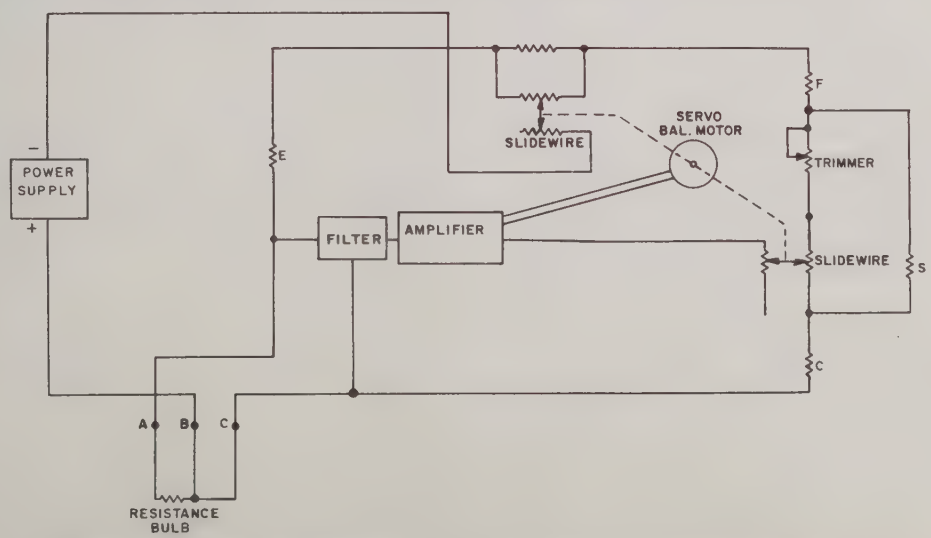


FIGURE 4-9 SIMPLIFIED SCHEMATIC OF D-C RESISTANCE BRIDGE MEASURING CIRCUIT.

SECTION V SERVICE

A. Test Equipment

An a-c and d-c voltmeter is required to perform most checks.

An **ohmmeter** is necessary when checking the continuity of the measuring system and balance motor windings.

A **potentiometric** test set is required (one with a range 0 to 150 millivolts) on potentiometer-type instruments.

A set of **test resistance spools** is handy for checking the resistance of measuring elements on resistance bridge type instruments. The Bristol Company manufactures very accurate test resistance spools. Spools may be ordered either by the set or singly for any value to fit calibration of the instrument. Ordinary variations in room temperature do not affect their accuracy. When ordering spools, specify serial number, curve and check point desired.

B. Adjusting Electrical and Mechanical Zero

1. Chart should be properly positioned over the guide pins on the drive roll and the pen should be perpendicular to the paper.

2. Connect a potentiometer test set to the measuring circuit input. Calibrate the test set and apply an emf equal to the low scale value. In many cases this is zero emf.

3. Turn the instrument power ON and allow to stabilize for 10 minutes.

4. Loosen the cord clamp on the pen carriage, Fig. 3-1 and position the carriage on the low scale value of the chart. Make sure sheave is not driving against the stop bracket, if it is, loosen the bracket before positioning the pen.

5. Turn the power off and readjust the mechanical stop by loosening the two screws holding the stop bracket, Fig. 2-1, shift the bracket sufficiently to permit the pen to stop on the dotted line (located just below the low scale value). Retighten the stop bracket holding screws.

6. Realign scale with pointer, if necessary, by loosening the four scale screws and sliding the scale.

C. Calibration Procedure

1. Chart should be properly positioned over the guide pins on the drive roll and the pen should be perpendicular to the paper.

2. Set the mechanical stop bracket approximately in the center (Fig. 2-1).

3. Loosen the cord clamp on the pen carriage (Fig. 3-1) so that the pen is free to move.

4. Rotate the drive sheave clockwise until it rests against the mechanical stop.

5. Position the pen on the mechanical zero (the dotted line 0.035" below the lowest scale value).

6. Slightly loosen the setscrews (2) on slidewire brush-arm hub (Fig. 3-2) so that the brush arm can be rotated on the shaft. It should not be so loose that the arm is free on the shaft.

7. Connect a potentiometric test set to the measuring circuit input. Calibrate the test set and apply an emf equal to the low scale value. In many applications this is zero emf.

8. Turn the instrument power ON and allow to stabilize for 10 minutes.

9. Rotate brush arm on shaft until the pen balances at the low end value on the chart.

10. Tighten the brush-arm hub setscrews and recheck the low scale alignment of pen and chart.

11. The pointer should be positioned in line with the pen. If it is not, loosen the pointer screws (Fig. 3-1) and realign.

12. Check alignment of the pointer and scale. If they do not line up loosen the four screws on the ends of the scale and reposition the scale.

13. Apply a signal from the test set equal to the upper scale value. If the pointer does not indicate correctly, adjust the span trimmer which is located above the slidewire (Fig. 3-2). In some applications this adjustment is made on the measuring circuit card.

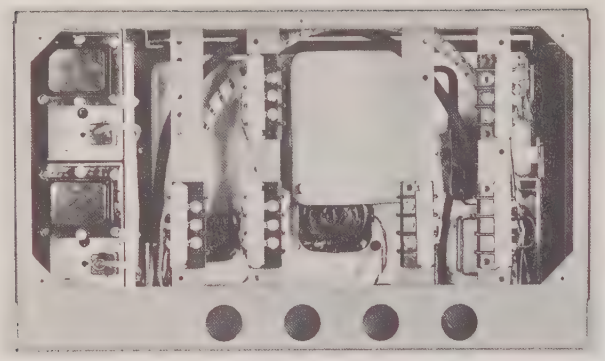


FIGURE 5-1 REAR VIEW OF TYPICAL 2-PEN RECORDER SHOWING TERMINAL BLOCK ARRANGEMENT.

D. Systematic Trouble-shooting Procedure

1. Check the recording system or balance motor for excessive friction. Turn off the instrument power and move the 4" driven gear (bullgear) by hand. If undue friction or binding is evident, check the balance motor, gear train, pulleys, pen carriage, and clearance of pointer and scale.

2. First, make sure power is supplied to the instrument. With the instrument switch on, check for 120 V. at power terminal block on the chassis plate with a multimeter (Fig. 3-1).

If voltage does not exist, check input power terminals at the rear of the case.

3. Make sure the amplifier gain has not been accidently turned down.

If the instrument still does not operate, proceed as follows:

4. Measuring Circuit on Potentiometers. The potentiometer type of Dynamaster uses the null-balance potentiometer circuit. From the simplified schematic wiring diagram (Fig. 4-5), it will be noted that the measuring element is wired in series with the potentiometer circuit and amplifier. This means that an open circuit anywhere in the measuring circuitry, slidewire, or amplifier will produce the same result: No error signal in the circuit and consequently no output from the amplifier to the balance motor. To determine if the measuring element is at fault, remove the input-signal leads and connect a potentiometric test set to the input terminals. Apply a voltage equivalent to the range of the instrument. If the pen indicates the proper value, the fault is in the measuring element. If the instrument does not respond or drives to either end, the problem is in the slidewire or measuring circuit.

5. Measuring Circuit on Resistance Bridges. On a d-c bridge, (Fig. 4-9), the measuring element is wired so as to form one leg of the bridge. An open circuit in the bridge will usually produce an infinite resistance, driving the pen to the top or bottom of the chart depending upon what portion of the bridge is open circuited. If an open circuit is suspected, check the primary element with an ohmmeter. If the power supply lead to the resistance bulb is open, the instrument will not drive. See separate instructions covering servicing and checking procedures for the particular measuring element used.

6. Slidewire and Contact Check. The contact arm should be removed and inspected.

Clean the contact and slidewire carefully with Bristol cleaning fluid and allow to dry. If the contact is badly worn it should be replaced. The replacement contact should have a pressure of 35-45 grams.

Apply a small amount of Cramolin on the slidewire and lightly wipe off the excess with a clean, lint-free cloth.

Caution: If a solvent other than Bristol's cleaning fluid is used to clean slidewire, it must be of a type that will not leave a residue or one that attacks varnish.

Check the continuity of the slidewire with an ohmmeter. First remove the lower female slidewire connectors from the printed circuit trimmer board. The slidewire resistance between pink and blue leads should normally be 175 ohms. The resistance between the green and blue leads should be 0 to 175 ohms depending on the position of the slidewire contact or the type of slidewire used.

If necessary, the slidewire should be removed and inspected under a microscope for wear.

Check continuity across the slidewire trimmer.

Next, remove the protective screen on the electronic module by loosening the holding screws (**Caution:** Make sure any hazardous common mode voltages have been removed from the primary element input terminals). Slide the screen back until the enlarged part of the slots are in line with the screw heads. Remove the screen.

7. Amplifier-Motor Check. Remove the input connector (item 9, fig. 4-3) and apply a d-c voltage (approx. 10 mv.) from a test set to the amplifier input. The pen should drive to one end of the scale. Reverse the test set polarity and the pen should drive to the other end. This indicates the problem is in the measuring circuit or primary element.

If the instrument does not drive, the fault is in the amplifier or motor. Refer to check (10) and (11).

8. Reference Voltage Check. Check the reference voltage at the amplifier with a multimeter. This open circuit voltage should be 8 to 9 volts when checked with the measuring circuit load removed. If the voltage is much less than 8 volts, the problem is in the reference voltage source circuitry or the power to it.

9. Measuring Circuit Module Check. If the above checks have been performed and the instrument still fails to function, the possible fault may be either an open circuit or a short circuit somewhere in the measuring module.

Access to the measuring circuit and filter is obtained by removing the side cover. Check for loose connections. Pull out and inspect the measuring circuit card, if necessary, unsolder the resistance spools and check values on a wheatstone bridge. Care should be taken when applying heat to the printed circuit card.

10. Amplifier Check. Referring to step (7) apply a d-c signal (approx. 10 mv.) to the amplifier input. Measure the a-c drive voltage across the red and blue motor leads at the chassis terminal block with a multimeter. The voltage should be about 12 volts a.c.

If not, replace the amplifier.

The amplifier may be taken out by loosening the two holding screws; sliding the amplifier ahead until the larger slotted holes are in line with the screws. Remove the amplifier.

11. Balance Motor Check. With power switch off, disconnect the motor leads from the chassis terminal block. Measure the d-c resistance of the control winding (red and blue) and reference winding (black and white). The control winding should be approximately 6 ohms and the reference winding should be approximately 225 ohms. If an open or short is indicated, replace the motor.

If the d-c resistance is normal, connect the white and blue leads to the L2 terminal, the black lead to the L1 terminal. Add a 2 to 10 mfd. paper, or non-polarized electrolytic capacitor from L1 to the red lead. **Do not** connect the red lead directly to L1 as the control winding is rated for 15 volts. Turn instrument power on; the motor should drive the pen to one end of the scale. If there is no drive, replace the motor.

E. Chart Drive Clutch Adjustment. (See Fig. 2-1)

The chart-drive clutch should be tight enough to drive the chart at all speeds without slipping (time scale error), and yet allow the chart to be advanced without overloading the chart drive or motor gear train. This clutch is set at the factory at 30-40 oz. in. If, for any reason, it is desired to change this setting, the clutch nut may be adjusted to increase or decrease the spring tension on the clutch.

F. Replacing the Pen Drive Cord. (See Fig. 1-6)

To replace a broken or worn cord, loosen the clamps on the drive-cord sheave and on the pen carriage, and take out the old cord. Turn the sheave counterclockwise to the stop. Sheave clamps will be on top. Thread one end of the cord under the right-hand clamp through the adjusting arbor. Wind a few turns around the arbor by turning the center screw clockwise. Thread the cord over the post and into the rear groove of sheave, around the left-hand pulley and then the right-hand pulley, once around the front groove on the sheave and over the post. Then thread the end of the cord under the left hand clamp and tighten clamp. Make sure the cord is on all pulleys, in the grooves of the sheave and in the clamping position on the pen carriage. Turn the adjusting arbor clockwise to tighten the cord. The tension should be sufficient to prevent backlash but not so tight as to cause excessive friction on the pulleys. Tighten the sheave cord clamps and clip off excess cord.

Check operation by rotating the sheave by hand (with power off). Set the sheave against the mechanical stop by rotating it **clockwise.** Then, slide the pen carriage to the left and line up the pen with the mechanical zero (dotted) line. Tighten cord clamp on the pen carriage. Check limits of pen operation by turning the sheave by hand from the low limit to the high limit stop. Check all clamps for tightness.

G. Door Removal

1. Gasketed door. Open the door fully. Lift stop bracket off of the pen and swing it forward. Turn the upper hinge pin out and push it down within the groove in the door. Lift the door off the lower hinge.

2. Tuck-away door. Loosen the two clamping screws found at the top inside corners of the door. Slide the plastic hinge pins inward, out of engagement with the rails, and pull the door straight out.

H. How to Remove Chassis from Case

The chassis may be removed from the case without disturbing the chassis wiring.

Disconnect the power and signal leads at the customers side of the terminal blocks located at the rear of the case.

Remove the screws, one at each end of the terminal block mounting strap, leaving the terminal blocks mounted to the straps and the wiring connected to the instrument side of terminals.

Pull out the chassis approximately half way.

Remove the long dog-point socket setscrews from the end of each slide rail (see Fig. 1-8).

Remove the chassis straight out of the case.

Note: The wrench socket is on the top side of the left-hand rail and on the bottom side of the right-hand rail.

To install chassis, push both side rails all the way into the case. Place terminal block straps and leads inside the case. Carefully insert the plastic slides within the rails and push the instrument partially within the case. Pull the instrument back out approximately two (2) inches and insert the long dog-point setscrews in the ends of the rails. The left-hand stop-screw is inserted from the top of the rail and the right-hand stop-screw goes in from the bottom. (See Fig. 1-8.)

Attach the terminal block strap to the flange at the rear of the case with #10-32 screws, nuts and a lockwasher. The terminal end of the bowed leads is anchored under the nut at the lower end of the terminal block strap. The power terminals should be on the amplifier side of the case and the signal terminals should be on the opposite side of the case.

I. Repairs, Correspondence and Shipping

If the Dynamaster cannot be repaired with the information furnished in this instruction, it should be shipped to the nearest Company Branch Factory or Main Factory for repair or replacement. Do not ship instruments to Branch Offices. Be sure to mark your return address plainly.

In all correspondence please state the instrument model and serial number, listed on the nameplate, and your repair order number.

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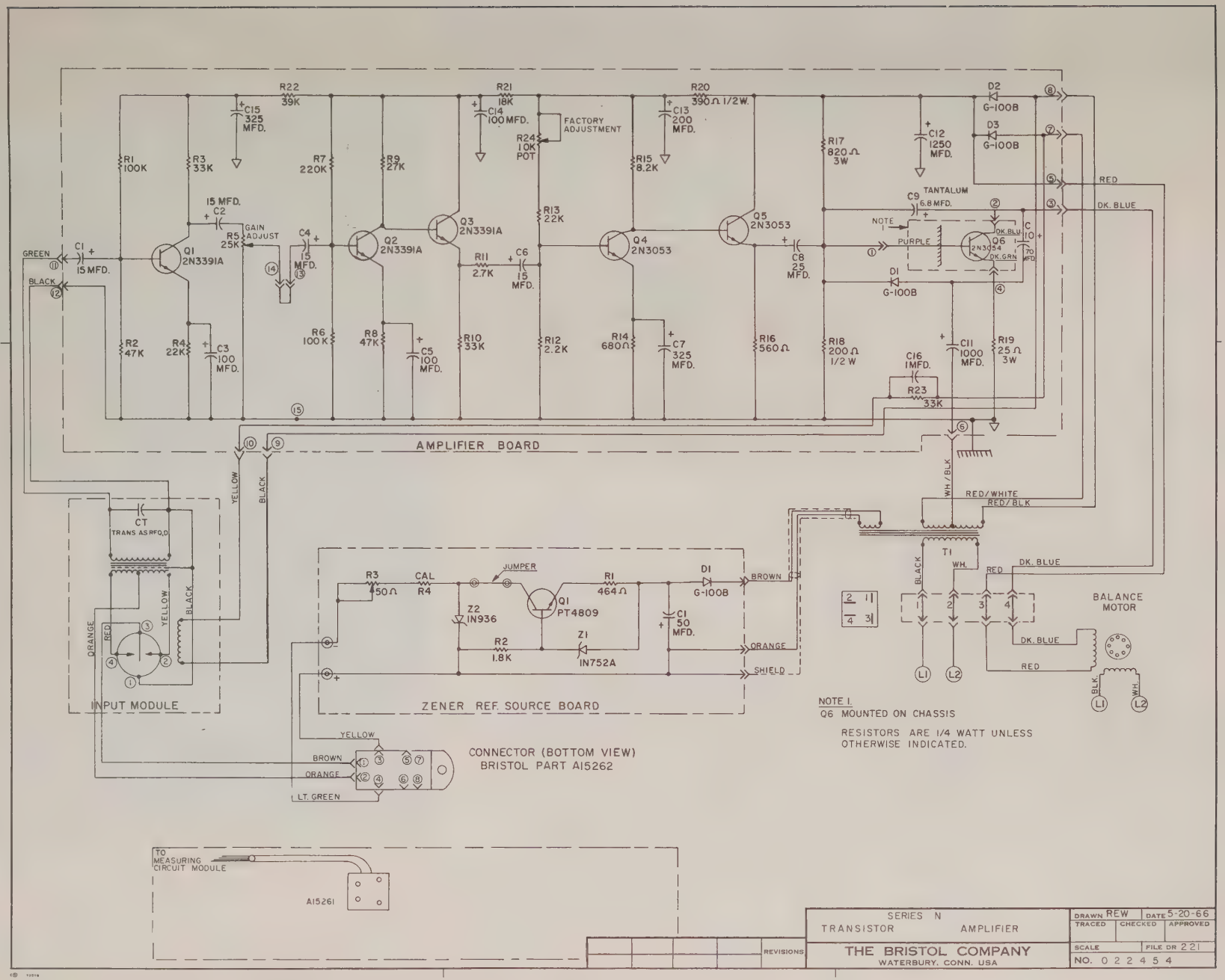
R22 39K
R21 18K
R20 390Ω 1/2W.
C15 325 MFD.
C14 100 MFD.
FACTORY ADJUSTMENT
R24 10K POT
C13 200 MFD.
D2 G-100B
D3 G-100B
R17 820Ω 3W
C12 1250 MFD.
R1 100K
R3 33K
R7 220K
R9 27K
R15 8.2K
TANTALUM
C9 6.8 MFD.
RED
DK. BLUE
15 MFD.
C2
GAIN ADJUST
R5 25K
C4 15 MFD.
R13 22K
NOTE 1
PURPLE
DK. BLU
DK. GRN
C10 10 MFD.
GREEN
C1 15 MFD.
BLACK
Q1 2N3391A
Q2 2N3391A
Q3 2N3391A
Q4 2N3053
Q5 2N3053
Q6 2N3054
R11 2.7K
C6 15 MFD.
C8 25 MFD.
D1 G-100B
R2 47K
R4 22K
C3 100 MFD.
R6 100K
R8 47K
C5 100 MFD.
R10 33K
R12 2.2K
R14 680Ω
C7 325 MFD.
R16 560Ω
R18 200Ω 1/2 W
C16 1MFD.
C11 1000 MFD.
R19 25Ω 3W
R23 33K
AMPLIFIER BOARD
YELLOW
BLACK
WH / BLK
RED/WHITE
RED/BLK
CT
TRANS AS RFQ'D
INPUT MODULE
R3 450Ω
CAL R4
JUMPER
R1 464Ω
D1 G-100B
BROWN
Z2 IN936
Q1 PT4809
C1 50 MFD.
R2 1.8K
Z1 IN752A
ORANGE
SHIELD
ZENER REF. SOURCE BOARD
T1
WH.
RED
DK. BLUE
BLACK
BALANCE MOTOR
L1
L2
BLK.
WH.
NOTE 1.
Q6 MOUNTED ON CHASSIS
RESISTORS ARE 1/4 WATT UNLESS OTHERWISE INDICATED.
CONNECTOR (BOTTOM VIEW)
BRISTOL PART A15262
LT. GREEN
TO MEASURING CIRCUIT MODULE
A15261
REVISIONS
SERIES N
TRANSISTOR AMPLIFIER
THE BRISTOL COMPANY
WATERBURY, CONN. USA
DRAWN REW
DATE 5-20-66
TRACED
CHECKED
APPROVED
SCALE
FILE DR 221
NO. 022454

INSTRUCTION NO. P12550-1

MULTIPLE-POINT SERIES 550 DYNAMASTER RECORDER

Note: This instruction is supplementary to the standard Series 550 Dynamaster instruction book P12550 and covers only the special features of the Dynamaster multiple-point recorder.

A. Amplifier Gain Adjustment

The gain adjustment on multiple-point recorders is made in the same manner as on single-pen recorders except that the motor on the multiple-switching mechanism must be stopped during this adjustment. A switch (item 6, fig. 1), is provided for this purpose.

B. Replacing Ink Felts

When the printing record becomes too light for easy reading, the ink felts should be changed. The single-color ink felt may be replaced by removing the thumb nut and sliding off the old felt.

The multi-colored felts should be replaced one at a time so that the color sequence will not get mixed up. When replacing the felt holder in the multi-colored unit, be sure to line up the pin in the holder with the hole in the gear, and the hole in the indicating disk with the pin in the felt holder.

C. Lubrication

In addition to the lubrication points mentioned in the standard Dynamaster instructions, the following additional points on multiple-point recorders should be lubricated once a year with Gulf Electric motor oil or Bristol oil Part No. 91982.

1. The three oil holes (fig. 2) in the print wheel assembly.
2. The holes at each end of shaft (item 1, fig. 1).
3. There are three oil holes (not visible in fig. 1) in the multiple-printing assembly. Also put a drop of oil on the fibre gear (item 3, fig. 1) of the print wheel assembly.
4. All shaft bearings.
5. The idler gear (item 4, fig. 1) that meshes with spline shaft.
6. The end bearings on spline shaft.
7. Holtzer-Cabot gear case motors with oil cup (item 5, fig. 1), used on the multiple-switching mechanism, should be oiled every 3 months with 3 cc's of light oil (Bristol Part No. 91982 for 2 ounce can).

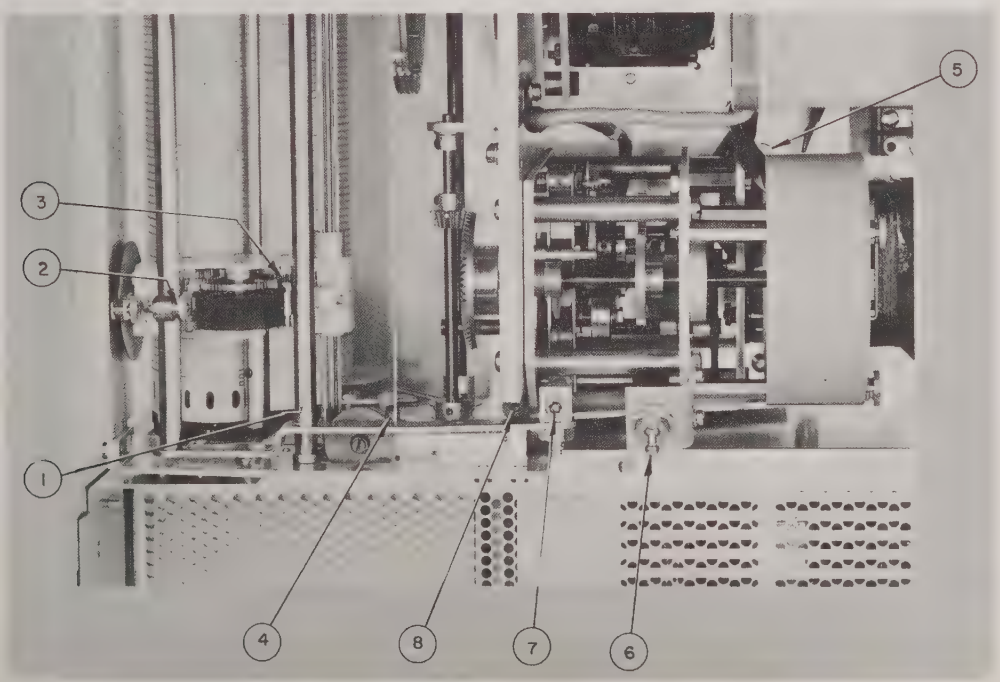

FIGURE 1. TOP VIEW SHOWING MULTIPLE PRINTING MECHANISM

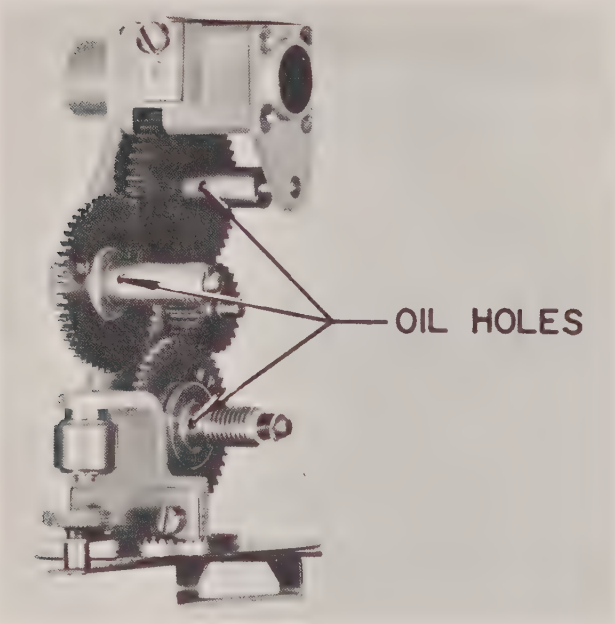

FIGURE 2. PHOTO SHOWING OIL HOLES IN PRINT WHEEL ASSEMBLY

D. Selector-Switch Contacts

The selector-switch contacts are normally self cleaning. Remove protection cover and inspect the contacts periodically. If contacts need cleaning, they should be cleaned with a cloth and a solvent such as Bristol cleaning fluid Part A5700. After cleaning, the contacts should be lubricated with a very thin film of Cramolin, Part No. 98130. It is not necessary to remove the brush arm when cleaning the contacts. The brush arm may be rotated counterclockwise without damaging the unit or getting the print wheel out of step. The switch contact plate hub has a locating pin that fits into a hole in the brush arm assembly. In this way, if the brush arm is taken off, the brush arm can be easily and correctly returned to its synchronized position. Always push brush arm tightly against hub of contact plate before retightening its setscrew.

E. Adjustments

The following adjustments are made in the factory and normally do not need readjustment.

1. Printing head height is adjusted by screw (item 8, fig. 1). A clearance of 0.025 inches is required between the chart paper and the print head when in the non-print position.

2. Printing pressure is governed by adjusting nut (item 7, fig. 1). A 1/32 inch clearance is required between the washer and yoke block when in the print position.

Note: The print pressure may be reduced by turning nut (item 7, fig. 1) clockwise.

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PARTS LIST P12551

DYNAMASTER RECORDER

SERIES 550, 551, 552, & 553

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THE BRISTOL COMPANY Waterbury, Connecticut 06720

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CASE BODY COMPLETE - DYNAMASTER MODELS 550 & 551

FIGURE 1. FRONT VIEW

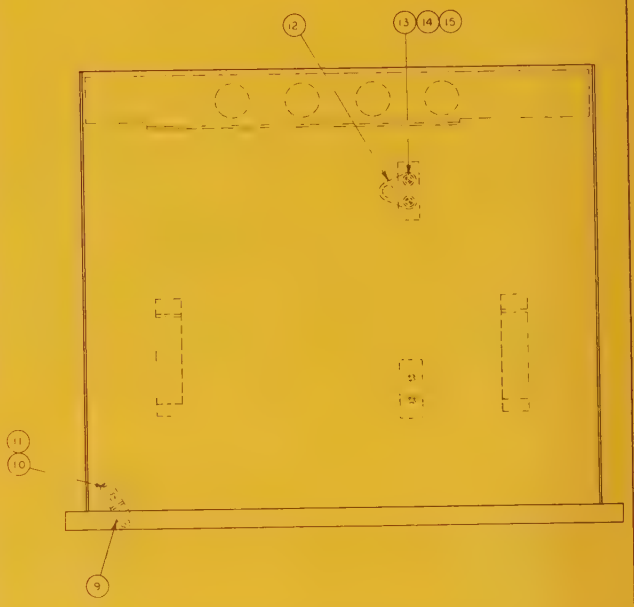

FIGURE 2. TOP VIEW

BE SURE TO STATE MODEL AND SERIAL NUMBER OF INSTRUMENT WHEN ORDERING PARTS

ITEM	PART NO.	DESCRIPTION
1		Case body complete (specify model & serial number)
		Case body only (specify model & serial number)
2	B4006	Slide complete
3	35639	#8 Lockwasher
4	26966	#8-32 Hex nut
5	A12771	Serial number plate
6	A15118	Bracket (door latch)
7	45692	#4 Lockwasher
8	30628	#4-48 x 3/16" Fillister-head screw
9	A15283	Latch (Model 550)
	A15290	Latch (Model 551)
10	18339	#6-40 x 3/16" Fillister-head screw
11	43040	#6 Lockwasher
12	A15130	Stop complete (latch)
13	10075	Washer
14	35638	#10 Lockwasher
15	86384	#10-32 x 3/8" Socket-head screw

CASE BODY COMPLETE - DYNAMASTER MODEL 552

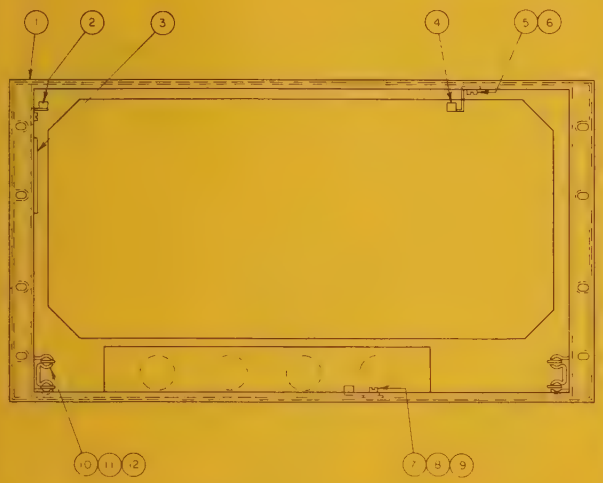

FIGURE 3. FRONT VIEW

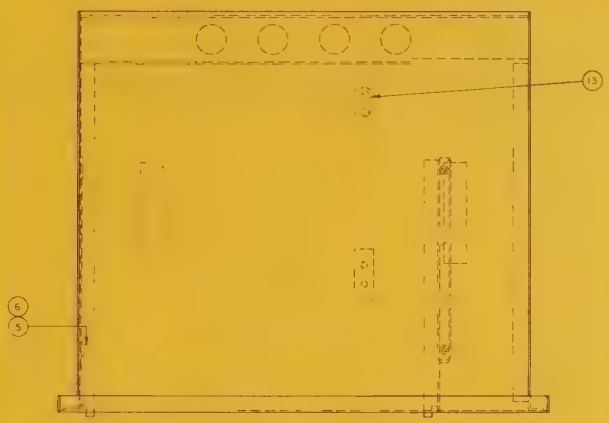

FIGURE 4. TOP VIEW

BE SURE TO STATE MODEL AND SERIAL NUMBER OF INSTRUMENT WHEN ORDERING PARTS

ITEM	PART NO.	DESCRIPTION
1		Case body complete (specify model and serial number) Case body only (specify model and serial number)
2	A15174	Rail (side)
3	A12771	Serial number plate
4	A15175	Rail (top)
5	43040	#6 Lockwasher
6	18339	#6-40 x 3/16" Fillister-head screw
7	10075	Washer
8	35638	#10 Lockwasher
9	86384	#10-32 x 3/8" Socket-head screw
10	B4006	Slide complete
11	35639	#8 Lockwasher
12	26966	#8-32 Hex nut
13	A15130	Stop complete

CASE BODY COMPLETE - DYNAMASTER MODEL 553

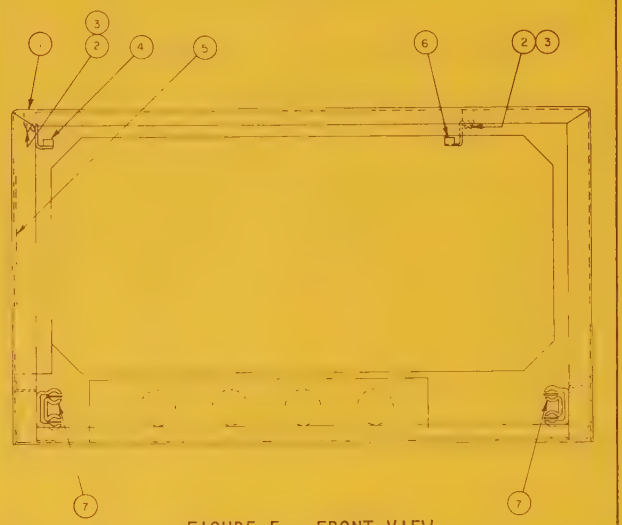

FIGURE 5. FRONT VIEW

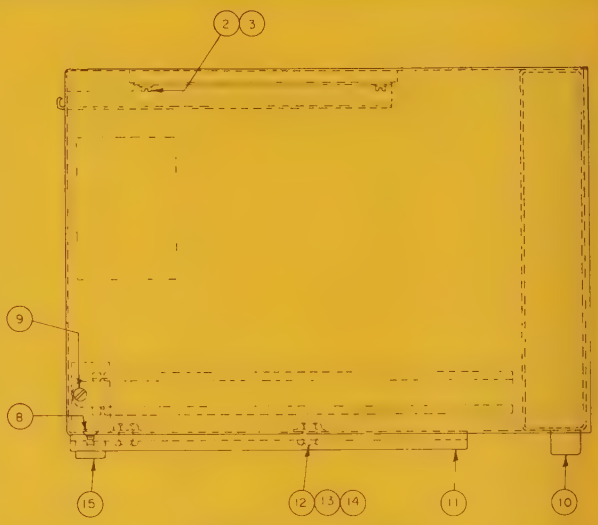

FIGURE 6. TOP VIEW

BE SURE TO SPECIFY MODEL AND SERIAL NUMBER OF INSTRUMENT WHEN ORDERING PARTS

ITEM	PART NO.	DESCRIPTION
1		Case body complete (specify model & serial number)
		Case body only (specify model & serial number)
2	43043	#6 Lockwasher
3	18339	#6-40 x 3/16" Fillister-head screw
4	A15176	Rail (left-hand)
5	A12771	Serial number plate
6	A15175	Rail (right-hand)
7	A15130	Slide complete
8	92693	#10-32 x 7/16" Flat-head socket screw
9	A15049	Nut
10	A15526	Foot (long)
11	A15527	Bar
12	35638	#10 Lockwasher
13	A15528	Stud
14	68556	#10-32 Hex nut
15	A15525	Foot (short)
Not Shown	A15130	Stop (located inside case toward rear)
	10075	Washer } Parts used for
	35638	#10 Lockwasher } mounting stop above
	86384	#10-32 x 3/8" Socket-head screw }

CASE DOOR COMPLETE (GASKETED) FOR MODELS 550 & 551

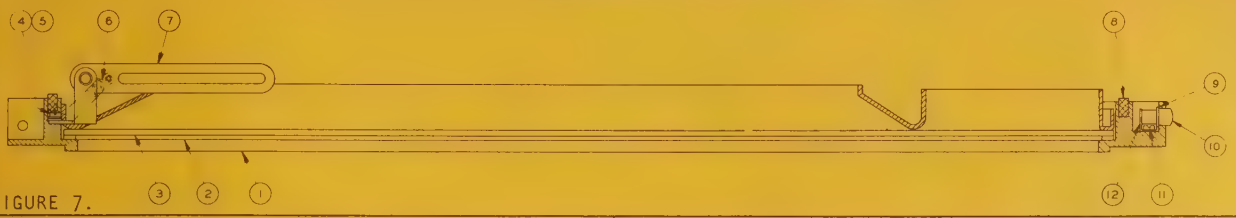

FIGURE 7.

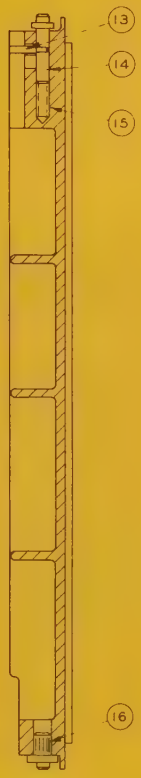

FIGURE 8.

FIGURE 9.

BE SURE TO STATE MODEL AND SERIAL NUMBER OF INSTRUMENT WHEN ORDERING PARTS

ITEM	PART NO.	DESCRIPTION
1		Door (specify model & serial number)
2	A15549	Tape (adhesive mounting) order 54"
3	A15116	Glass
4	23212	Washer
5	94692	#4-40 x 5/16" Self-tapping screw
6	A15550	Spring (door stop)
7	A15286	Door stop complete
8	A16781-1	Gasket
9	96464	Retaining ring (5/16")
10	A15112	Button
11	30628	#4-48 x 3/16" Fillister-head screw
12	A15119	Bracket
13	A15111	Pin
14	A15109	Pin (upper hinge)
15	A15120	Spring
16	A15110	Pin (lower hinge)
17	A8065	#4-40 x 3/16" Self-tapping screw
18	A15117	Clip
19	C3221	Frame
20	A15114	Plate

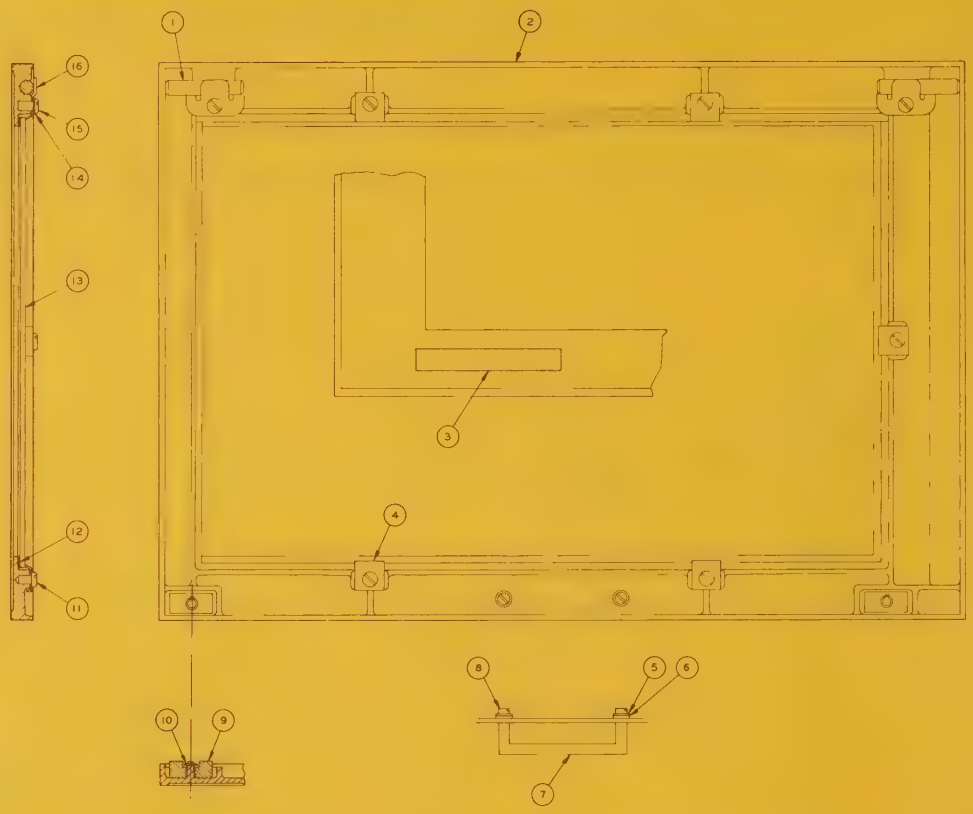

FIGURE 10. DOOR COMPLETE FOR DYNAMASTER MODEL 552 & 553

BE SURE TO STATE MODEL AND SERIAL NUMBER OF INSTRUMENTS WHEN ORDERING PARTS

ITEM	PART NO.	DESCRIPTION
1	A15246	Rod
2		Door (specify model & serial number)
3	A15310	Nameplate
4	A15252	Clip
5	74041	Lockwasher
6	47622	Washer
7	A15249	Handle
8	61247	#4-48 x 1/4" Fillister-head screw
9	A15248	Magnet
10	A15622	Retaining ring
11	88824	6 x 1/4" Self-tapping screw
12	A15549	Tape, adhesive mounting
13	A15250	Glass
14	3434	Washer
15	91089	#6-40 x 1/4" Special-head screw
16	A15247	Clip

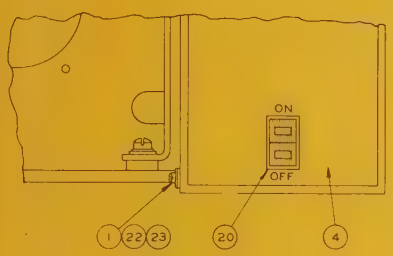

FIG. 11. FRONT VIEW OF CONTROL PANEL

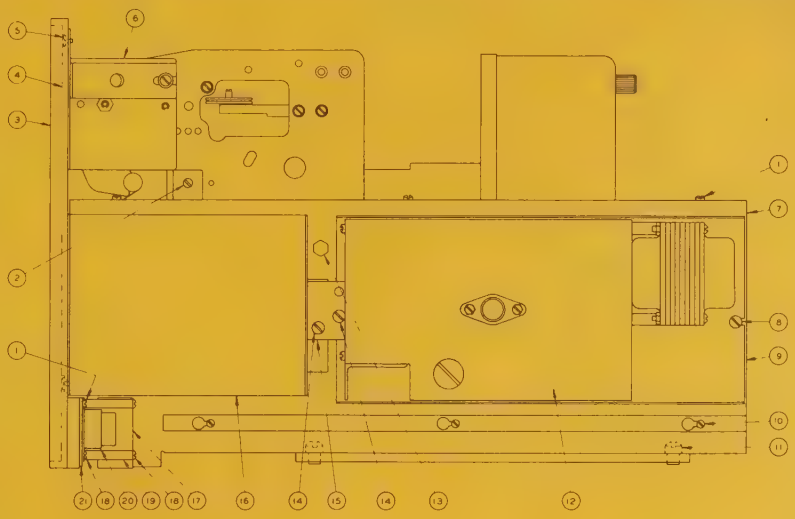

FIGURE 12. RIGHT SIDE SHOWING AMPLIFIER AND INPUT MODULE

BE SURE TO STATE MODEL AND SERIAL NUMBER OF INSTRUMENT WHEN ORDERING PARTS

ITEM	PART NO.	DESCRIPTION
1	18339	#6-40 x 3/16" Fillister-head screw
2	75373	#6-40 x 1/4" Special-head screw
3	C3210	Panel (control)
4	A15557	Escutcheon plate
5	A14799	Screw
6	A16691	Bracket (control)
7	C3229	Screen complete (1 pen)
	C3230	Screen complete (2 pen)
8	A15230	10 x 3/8" Self-tapping screw
9	C3208	Mounting plate (1 pen)
	C3205	Mounting plate (2 pen)
10	18339	#6-40 x 3/16" Fillister-head screw
11	67029	#10-32 x 5/16" Fillister-head screw
12	C3361	Amplifier 117 V. 60 Hz (D-C input)
	C3361-1	Amplifier 117 V. 50 Hz (D-C input)
	C3361-2	Amplifier 117 V. 60 Hz (A-C input)
	C3361-3	Amplifier 117 V. 50 Hz (A-C input)
13	A14783	Post
14	66537	#10-32 x 1/4" Fillister-head screw
15	A14904	Jumper
16	B4114	Input filter assembly
		Plug-in spool card - specify model, serial number and range of instrument
17	A14784	Shield
18	11898	#5-44 x 3/16" Special-head screw
19	A14785	Post
20	A14906	Switch
21	A14796	Switch plate
22	43040	#6 Lockwasher
23	21252	Washer

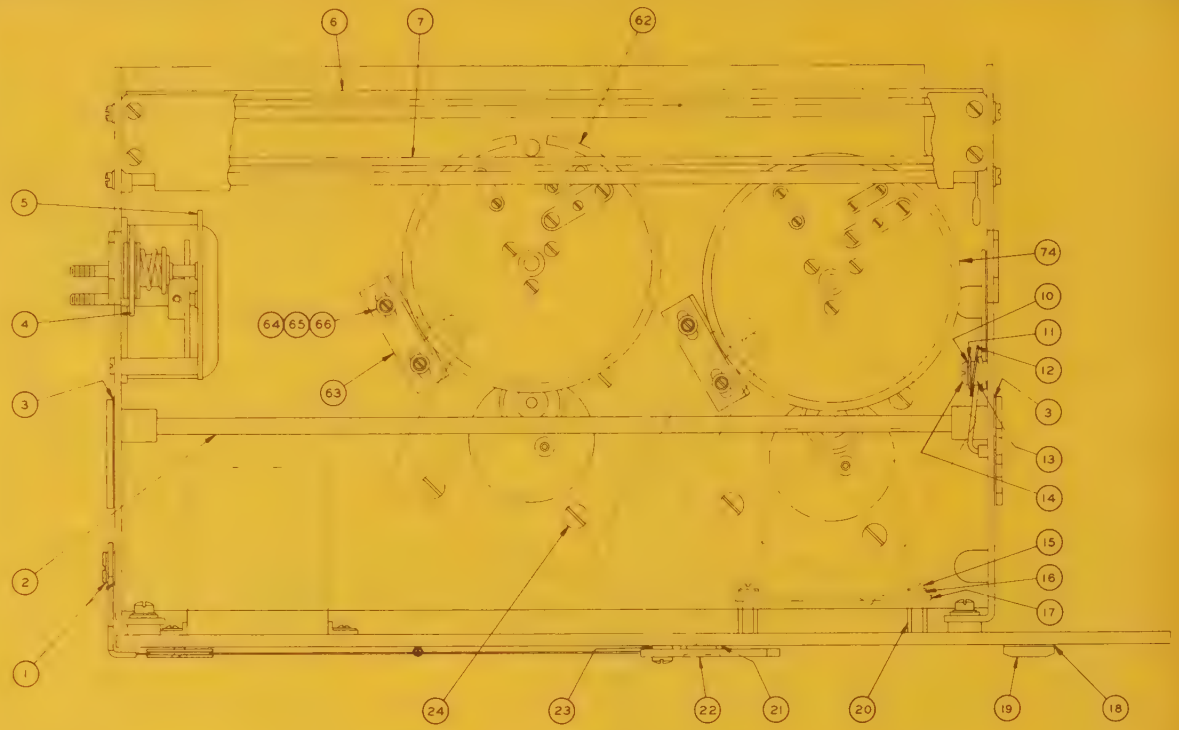

FIGURE 13. FRONT VIEW OF CHASSIS

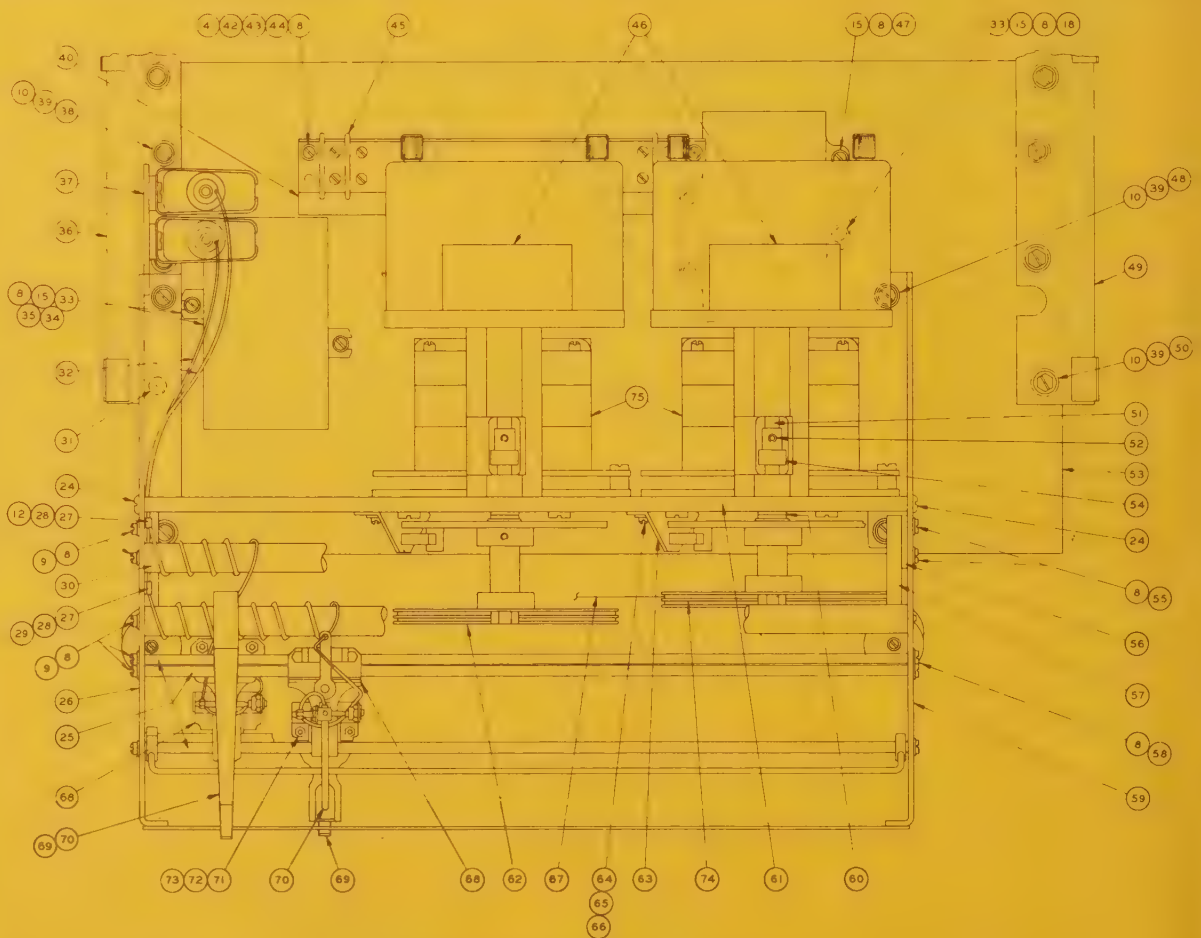

FIGURE 14. TOP VIEW OF CHASSIS

BE SURE TO STATE MODEL AND SERIAL NUMBER OF INSTRUMENT WHEN ORDERING PARTS

ITEM	PART NO.	DESCRIPTION
1	A15126	Washer
2	A14991	Shaft
3	A14992	Washer
4	A15161	Clutch complete
5	A15071	Bearing plate
6	A14710	Pen lifter, upper (two pen models)
7	A14715	Pen lifter, lower
8	43040	#6 Lockwasher
9	39770	#6-40 x 1/4" Fillister-head screw
10	35638	#10 Lockwasher
11	29414	Washer
12	27431	Washer
13	72166	Spacer
14	79594	#10-32 Special-head screw
15	75373	#6-40 x 1/4" Washer head screw
17	A16616	Mounting plate
18	A15263	Shim
19	A15264	Lifter pad
20	93392	Post
21	A15139	Washer
22	A15133	5/16"-24 Shoulder screw
23	34078	#10 Lockwasher
24	64512	#8-32 x 3/8" Binding head screw
25	A14701	Rod, guide
26	B4019	Plate, complete (LH)
27	A9181	Clip (cap tube)
28	90099	#3-56 x 1/4" Fillister-head screw
29	70694	#3 Lockwasher
30	A14712	Rod (cap guide)
31	66560	#10-32 x 1/4" Fillister-head screw
32	A14714	Tube (cap)
33	A12239	Mounting feet
34	C2629	Single d-c supply
35	C2630	Double d-c supply
36	A15000	Mounting strap complete L.H.
37	A14711	Plate (ink bottle)
38	66539	#10-32 x 3/8" Fillister-head screw
39	20004	Washer
40	A15386	Mounting strip
41	21252	Washer
42	A1998	Post
43	91089	#6-40 x 1/4" Special-head screw
44	A11334	Cover (Caution 9 pt.)
	A15384	Cover (Caution 14 pt.)
45	83646	Terminal block (9 pt.)
	A15385	Terminal block (14 pt.)
46	A15826	Label, caution
47	20903	#6-40 Hex nut
48	66541	#10-32 x 1/2" Fillister-head screw
49	A14998	Mounting strap complete (R.H.)
50	A15977	#10-32 Special-head screw
51	A15104	Shaft (pot)
52	82403	#6-40 x 1/8" Socket setscrew
53	C3217	Plate (chassis)
54	A14965	Pinion gear
55	69109	#6-40 x 1/2" Special-head screw
56	A14720	Spacer
57	A14706	Bar (pulley support)
58	68345	#6-40 x 3/16" Special-head screw
59	B4018	Plate complete
60	12248	Washer
61	C3212	Plate (servo)
62	B4029	Bull gear and sheave complete (No. 1 pen)
63	A15105	Stop bracket
64	40066	#8-32 x 1/4" Fillister-head screw
65	2420	Washer
66	35639	#8 Lockwasher
67	A12551	Cord (drive - 45" long)
68	A15276	Pen guide complete (No. 1 pen)
	A10897	Pen guide complete (No. 2 pen)
69	B2652	Pointer (No. 1 pen)
	A15245	Pointer (No. 2 pen)
70	A15856	Pen complete (No. 1 pen)
	A15857	Pen complete (No. 2 pen)
71	45692	#4 Washer
72	30628	#4-48 x 3/16" Fillister-head screw
73	85884	#4-48 Hex nut
74	B4030	Bull gear and sheave complete (No. 2 pen)
75	B4051	Balance motor } 3-second
	A15346	Pinion }
	B4055	Balance motor } 1-second
	A15346	Pinion }

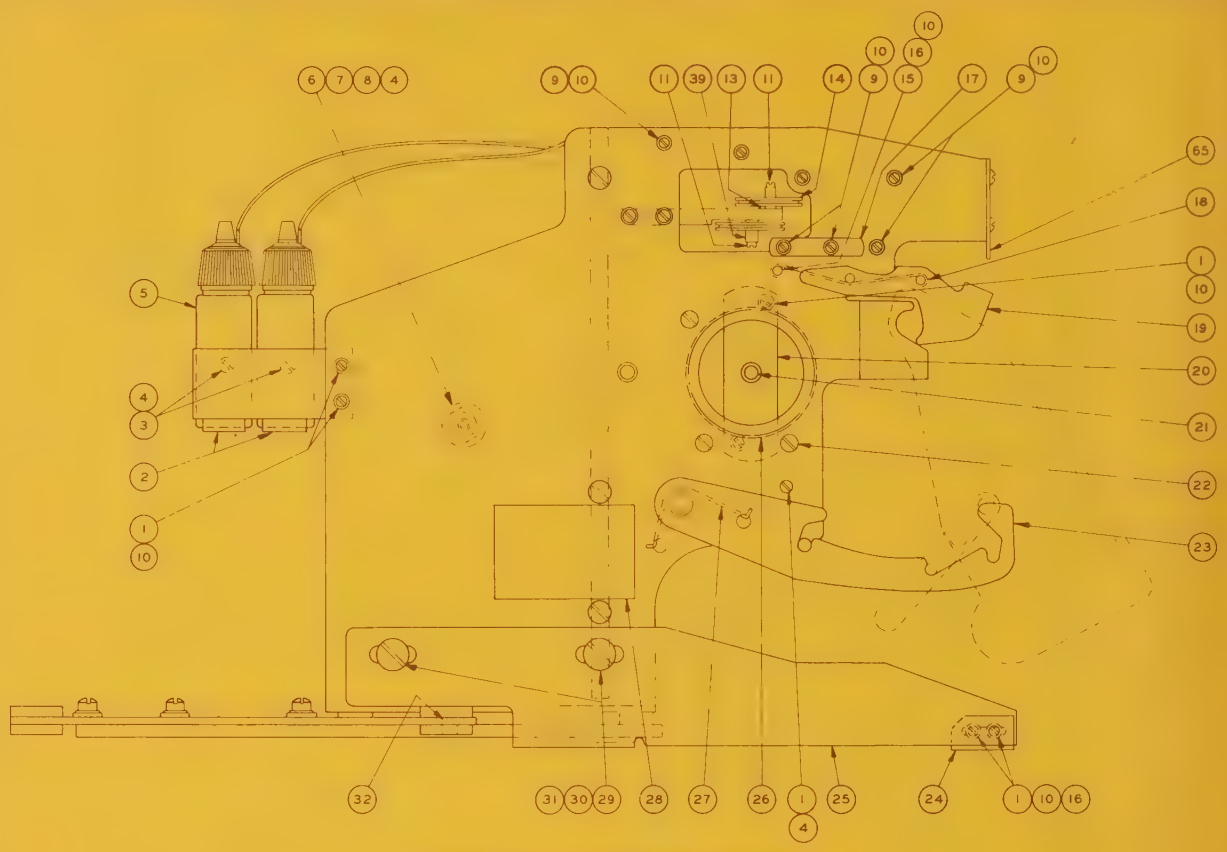

FIGURE 15. LEFT SIDE OF CHASSIS

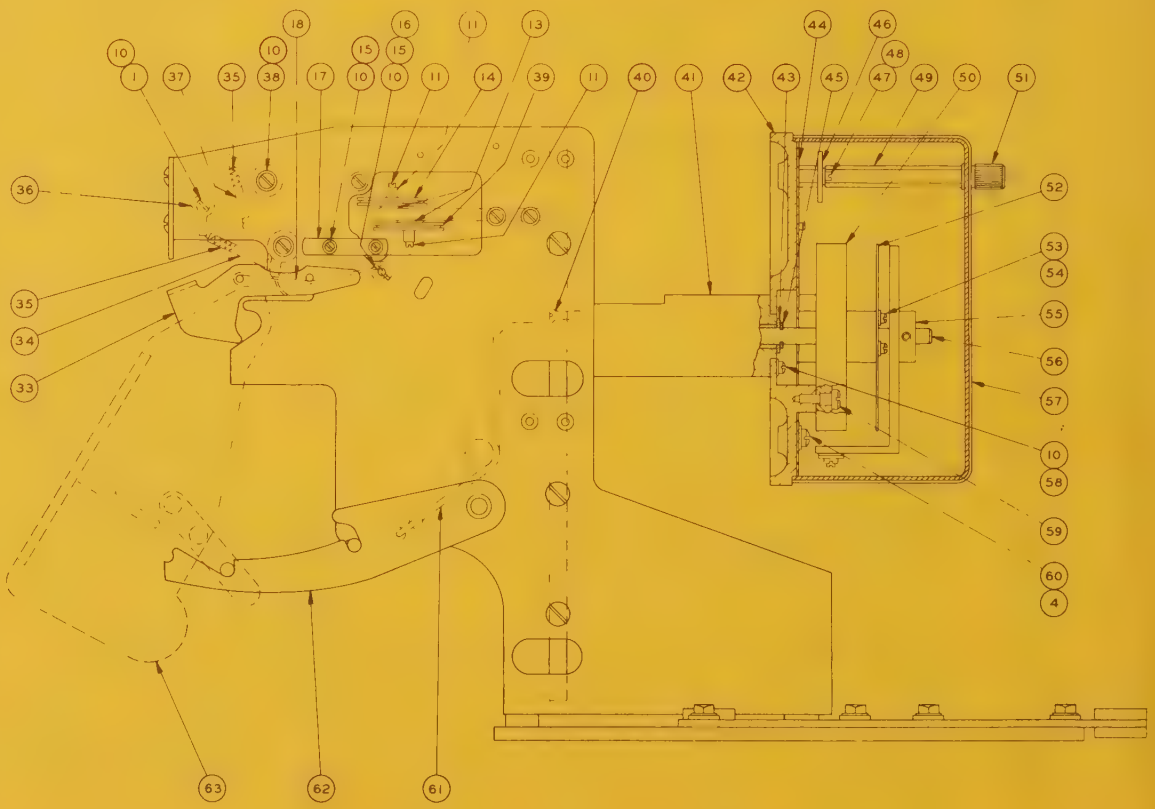

FIGURE 16. RIGHT SIDE OF CHASSIS

BE SURE TO STATE MODEL AND SERIAL NUMBER OF INSTRUMENT WHEN ORDERING PARTS

ITEM	PART NO.	DESCRIPTION
1	18339	#6-40 x 3/16" Fillister-head screw
2	A6362	Bracket (Ink bottle)
3	39425	#10-32 x 1/4" Special-head screw
4	35638	#10 Lockwasher
5	A6356	Ink bottle
6	72055	#10-32 Hex nut
7	73855	Stud
8	79209	Thumb nut
9	39770	#6-40 x 1/4" Fillister-head screw
10	43040	#6 Lockwasher
11	A14708	#3-56 Shoulder screw
13	37267	Washer
14	A14707	Cord pulley (for 3-second instruments)
	A15255	Cord pulley (for 1-second instruments)
15	68345	#6-40 x 3/16" Special-head screw
16	21252	Washer
17	A14777	Plate complete
18	A14984	Spring
19	A14981	Latch, upper L.H.
20	A15087	Bearing plate (shaft bearing)
21	A15096	Shaft (change gear)
22	76332	#6-40 Shoulder screw
23	A14987	Lower latch
24	A15137	Handle
25	B4032	Release arm
26	68556	#10-32 Hex nut
27	A14990	Spring latch
28	A13300	Serial plate
29	A15125	#8-32 Shoulder screw
30	28543	Washer
31	26966	#8-32 Hex nut
32	66560	#10-32 x 1/4" Fillister-head screw
33	A14980	Latch, upper L.H.
34	A10483	Stop tube (pen lifter)
35	61214	Spring
36	42605	Spring clip
37	A14718	Space tube (pen lifter)
38	69109	#6-40 x 1/2" Special-head screw
39		Cord pulley (see item 14)
40	35545	#6-40 x 1/2" Fillister-head screw
41	A15103	Bearing housing
42	C3231	Base plate, slidewire
43	38811	Washer
44	B4048	Slidewire shield
45	91015	"E" Ring
46	A15506	8-ohm }
	A15506-A	16-ohm } Trimmer (as required)
	A15506-B	40-ohm }
47	30628	#4-48 x 3/16" Fillister-head screw
48	45692	#4 Lockwasher
49	86014	Post
50		Slidewire (specify model & serial number of instrument)
51	A15240	Screw
52	A1998	Post
53	90099	#3-56 x 1/4" Fillister-head screw
54	70694	#3 Lockwasher
55	A16196	Brush Arm complete
56	A15104	Shaft (pot)
57	B4046	Cover complete
58	35882	#6-40 x 1/2" Fillister-head screw
59	A9835	#6-40 x 1/8" Flat-point setscrew
60	66541	#10-32 x 1/2" Fillister-head screw
61	A15294	Spring (chart stop)
62	A14989	Latch arm
63	D1564	Tilt chart drive metal
	D1565	Tilt chart drive rubber

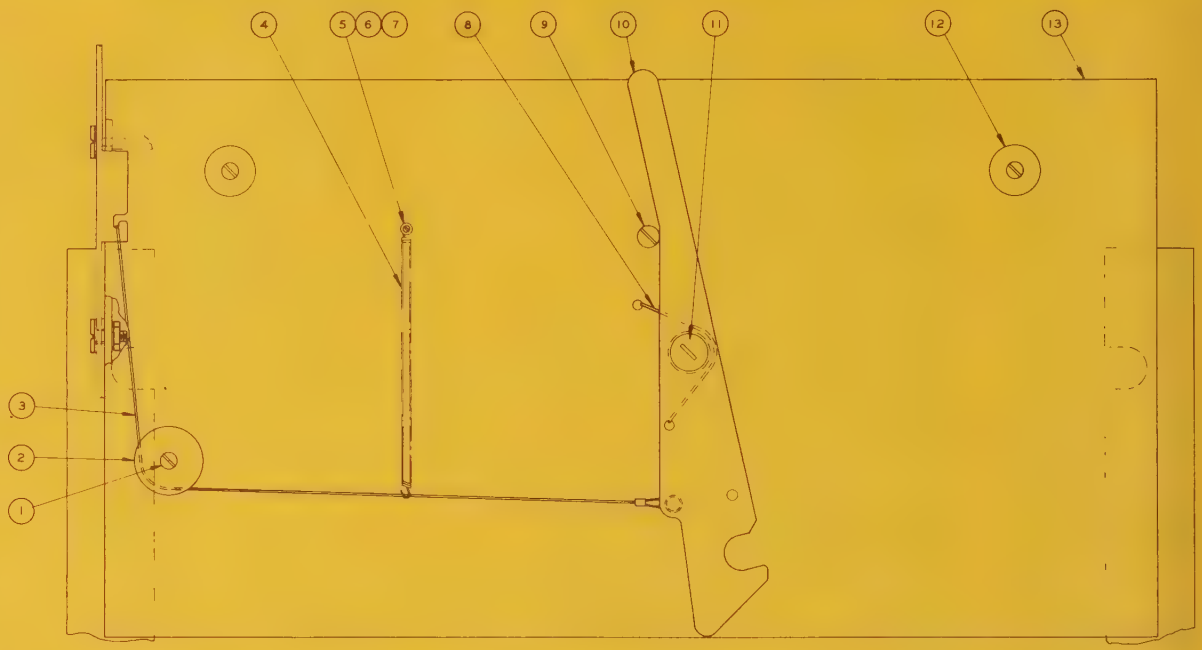

FIGURE 17. BOTTOM VIEW OF CHASSIS

BE SURE TO STATE MODEL AND SERIAL NUMBER OF INSTRUMENT WHEN ORDERING PARTS

ITEM	PART NO.	DESCRIPTION
1	A15244	#6-40 Shoulder screw
2	A15134	Pulley
3	A15140	Cord pull
4	A15135	Spring
5	30628	#4-48 x 3/16" Fillister-head screw
6	45692	#4 Lockwasher
7	28211	Washer
8	A15129	Spring
9	66538	#10-32 x 5/16" Fillister-head screw
10	A15127	Latch complete
11	A15133	5/16"-24 Shoulder screw
12	91089	#6-40 x 1/4" Special-head screw
13	C3217	Plate (chassis)

INSTRUCTION NO. Y19238
(Issue of 6/66)

ADJUSTMENT OF BLIND-SET ALARM CONTACTS

ATTACHMENT SPECS EH51A1 THRU EH51B4

USED ON SERIES 550, 551, 552 & 553 DYNAMASTER RECORDERS

A. Description

Blind-set alarm switches are used primarily to operate alarms or signal lights and are entirely independent of any other control circuit that may be in the instrument.

These switches are actuated by cams and cam rollers and are located on the back of the servo panel.

Single-pen recorders may have from 1 to 4 alarm switches.

Two-pen recorders may have from 1 to 4 alarm switches on each pen.

B. Wiring

A wiring diagram will be furnished with this instruction to cover the particular alarm circuit ordered. The alarm terminals are plainly marked on all instruments and correspond to the markings on the wiring diagram.

The power for operating the alarm may come from any source, such as a battery or an a-c power supply.

The maximum recommended capacity of the microswitches is as follows:

3 amperes at 125 or 250 volts a.c.
1/2 ampere at 125 volts d.c.
1/4 ampere at 250 volts d.c.

C. Adjustment

The switches are factory adjusted to operate at the point or points specified on the order. If it is necessary to change the operating point of the alarm switches, it may be done as follows:

Turn instrument power supply switch off. Move indicating pointer, by means of bull gear or motor pinion, to the point on the scale at which the first alarm is to operate. Loosen the setscrew in cam hub and rotate the cam until the cam-follower roller operates the switch. Then, retighten setscrew.

After the first switch is adjusted, shift indicating pointer to the point at which the second alarm is to operate. Then, rotate second cam until cam-follower roller operates second switch.

The third and fourth switches (if supplied) are adjusted in the same manner.

Be sure to retighten setscrews in cam hubs after any adjustment.

THE BRISTOL CO., WATERBURY, CONN., 06720, U.S.A.
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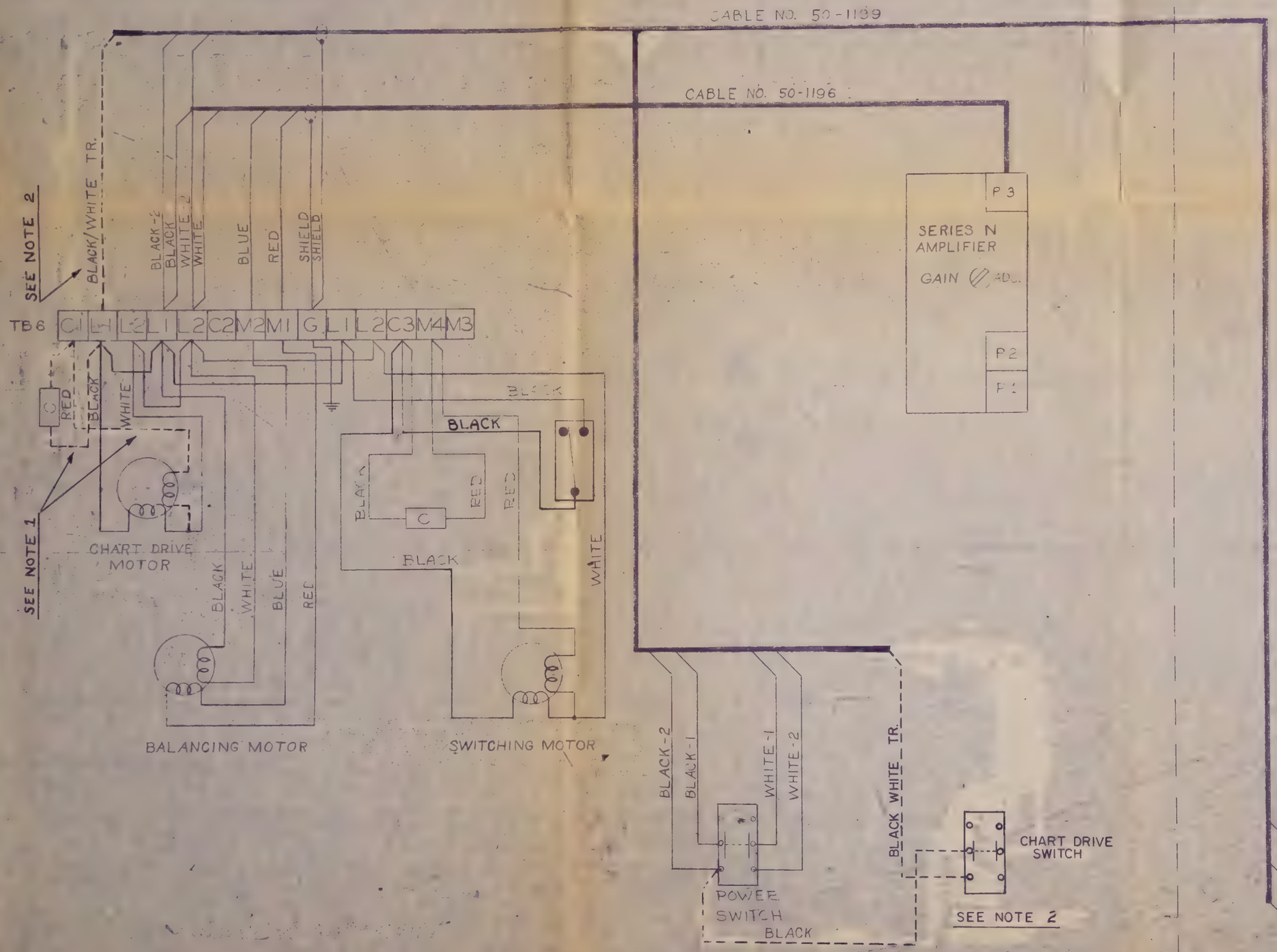
NOTES

1- USED FOR HIGH SPEED CHART DRIVE ONLY.

2- CHART DRIVE SWITCH OPTIONAL WHEN USED, JUMPER ON L1 TERMINALS FOR CHART DRIVE ARE OMITTED FROM TB 6



			FCR 117 4-13-67	REVISIONS
			9-16-66	

CONNECTION DIAGRAM POWER CIRCUIT, MULTIPOINT STANDARD SERIES 550 DYNAMASTER POTENTIOMETER

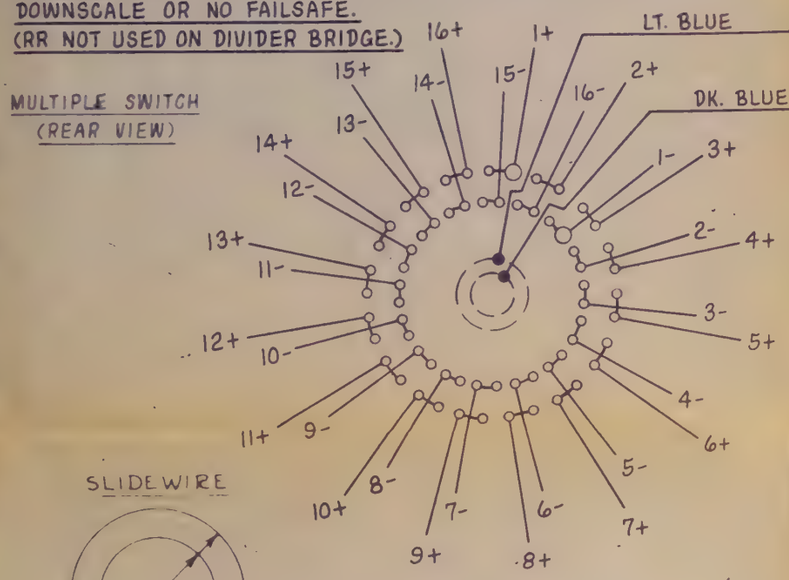
THE BRISTOL COMPANY
WATERBURY, CONN. USA

DRAWN PLS	DATE 8-3-66		
TRACED	CHECKED	APPROVED	
SCALE	FILE DR.		
NO. 022571			

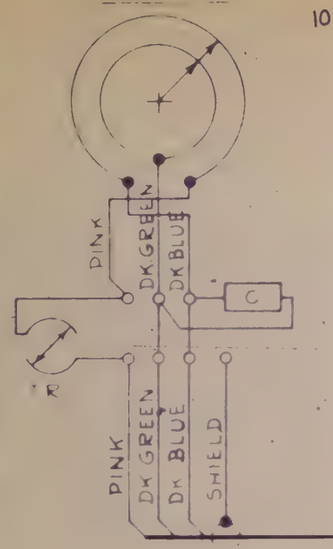
CAN.

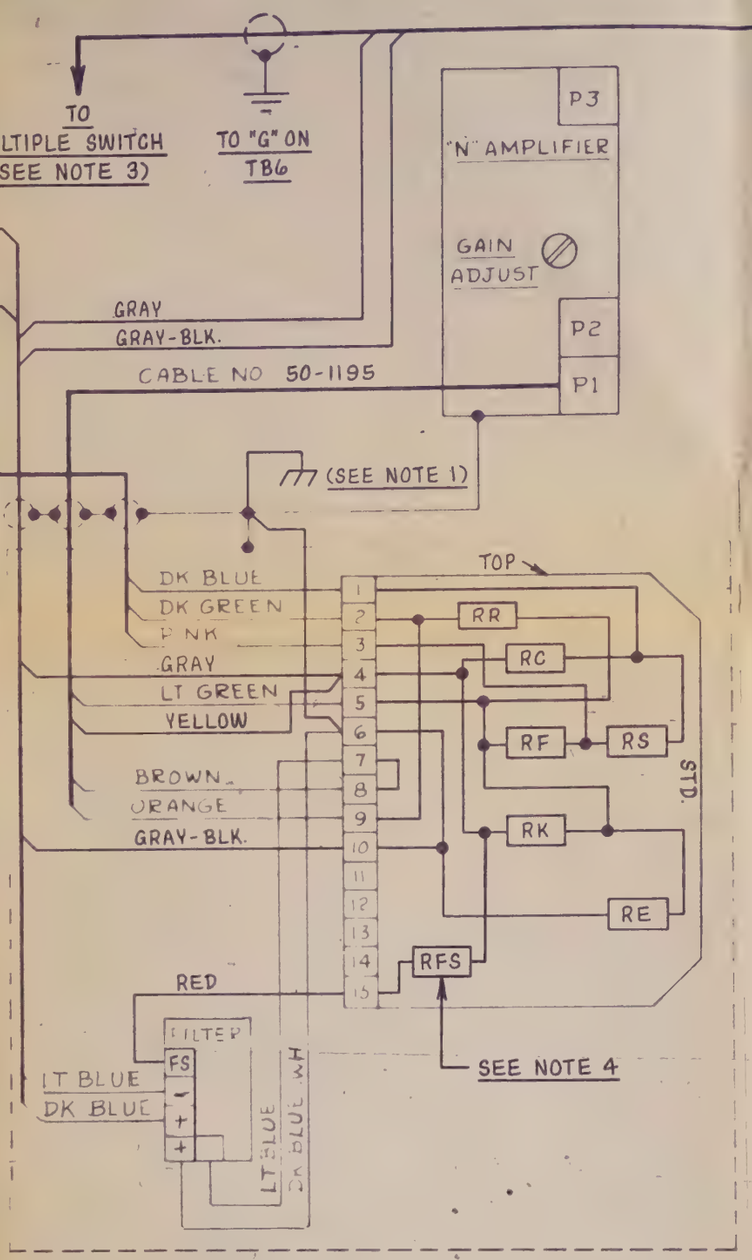
NOTES:
1. ⏚ INDICATES CIRCUIT IS AT GUARD POTENTIAL.
2. COMPENSATOR LOCATED ON BACK OF TB3.
3. LIKE POINTS BETWEEN MULTIPLE SWITCH & TERMINAL BLOCKS ARE CONNECTED AT JUNCTION AROUND COMPENSATOR.
4. "RFS"-FAILSAFE AS REQ'D. 5 TO 15 UPSCALE, 4 TO 15 DOWNSCALE.
5. "RR" AS REQ'D. 2 TO 4 WITH UPSCALE FAILSAFE, 2 TO 5 WITH DOWNSCALE OR NO FAILSAFE.
(RR NOT USED ON DIVIDER BRIDGE.)

MULTIPLE SWITCH
(REAR VIEW)

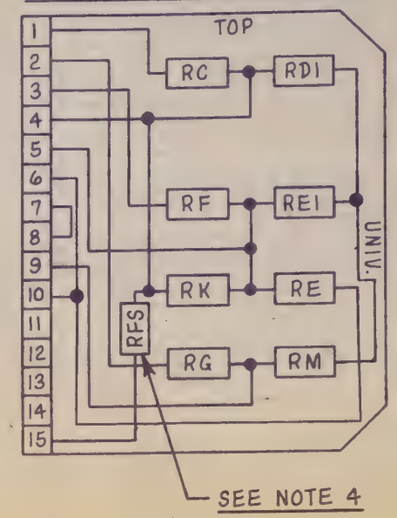


SLIDEWIRE

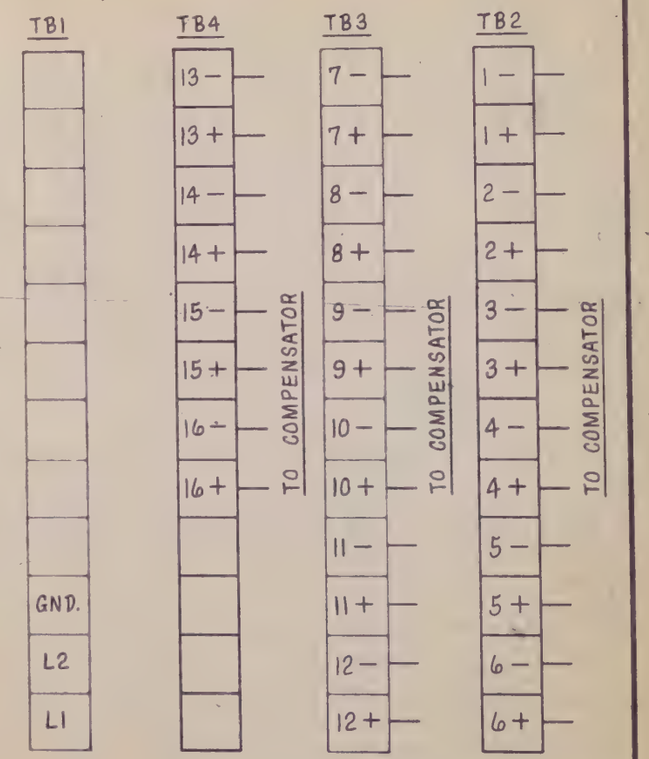




AUXILIARY VIEW
CIRCUIT FOR DIVIDER BRIDGE



REAR OF CASE



COLOR CODE (SEE NOTE 3)

1+	13+	GRAY	1-	13-	VIOLET
2+	14+	PINK	2-	14-	BROWN
3+	15+	LT. BLUE	3-	15-	LT GREEN
4+	16+	ORANGE	4-	16-	TAN
5+		DK GREEN	5-		DK BLUE
6+		YELLOW	6-		RED
7+		GRAY-BLK	7-		VIOLET-WH
8+		PINK-BLK	8-		BROWN-WH
9+		BLUE-WH.	9-		GREEN-WH
10+		ORANGE-WH	10-		TAN-WH
11+		WHITE-BLK.	11-		BLACK-WH.
12+		YELLOW-BLK	12-		RED-WH.

TABLE 1:
SELECT LEADS AS REQUIRED PER CURVE

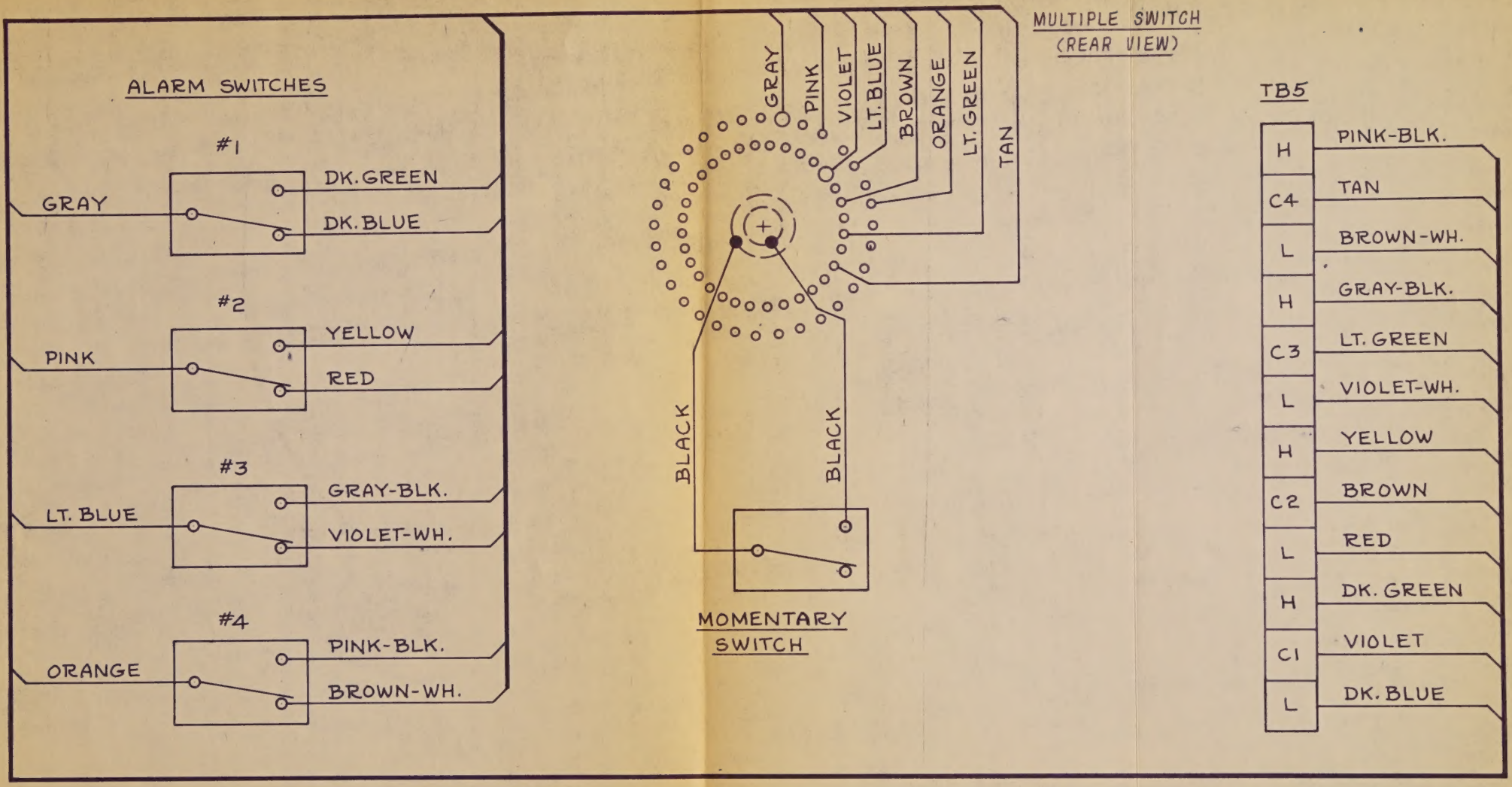
		+	–
"J"	(IRON-CONSTANTAN)	WHITE	RED
"K"	(CHROMEL-ALUMEL)	DK BLUE	RED
"T"	(COPPER-CONSTANTAN)	DK BLUE	RED
"S"	(PLAT-PLAT 10% RHOD.)	DK BLUE	LT. BLUE
"MV"	(COPPER-COPPER)	DK BLUE	LT BLUE

2340	ECO 2258	E.C.O.
4-13-67	3-21-67	DATE

CONNECTION DIAGRAM, MEASURING CIRCUIT, 16 POINT PYROMETER, STANDARD OR DIVIDER BRIDGE, WITH INPUT FAILSAFE, SERIES 550 DYNAMASTER POTENTIOMETER.

THE BRISTOL COMPANY
WATERBURY, CONN. U.S.A.

DRAWN B.F.H. DATE 3-10-67
J.J.V.
SCALE — SHEET 221
DWG NO 022661-16



CONNECTION DIAGRAM, AUXILIARY CIRCUIT, 4 SELECTIVE ALARMS (POINTS 1-4), 16 POINT SERIES 550 DYNAMASTER POTENTIOMETER

REVISIONS			

THE BRISTOL COMPANY
WATERBURY, CONN. U.S.A.

DRAWN ARE	DATE 6-14-67	
TRACED	CHECKED	APPROVED JJJ
SCALE	FILE DR 122	
NO. 023240		

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American Welded & Weldless Chain and Attachments, ACCO Registered & Kuplex Sling Chains, Allison Abrasive Cut-Off and Grinding Wheels; Campbell Abrasive Cut-Off Machines; Hydraulic Presses, Nibbling Machines, Punches, Dies; Victor Masonry Cutting Saws and Blades; Malleable Iron Castings; Bristol Socket Screws; Maryland Bolts and Nuts; Weed Tire Chains

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MATERIAL HANDLING GROUP

Mechanical Handling Systems, Automotive Power and Free, Tow Line, and Sortation Systems; Floor Lines and Overhead Trolley Conveyors; Driverless Tractors; Work Carriers and Storage Racks; Louden Monorail Cranes and Systems; Wright Hoists and Cranes; Manseaver Grabs and Custom Engineered Hook Attachments; ACCO Chain, Wire Rope, Nylon, Dacron, and Woven Wire Slings, ACCO Custom Engineered Material Handling Equipment, Wire Rope and Cable Winches

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